2 FEBRUARY 1961

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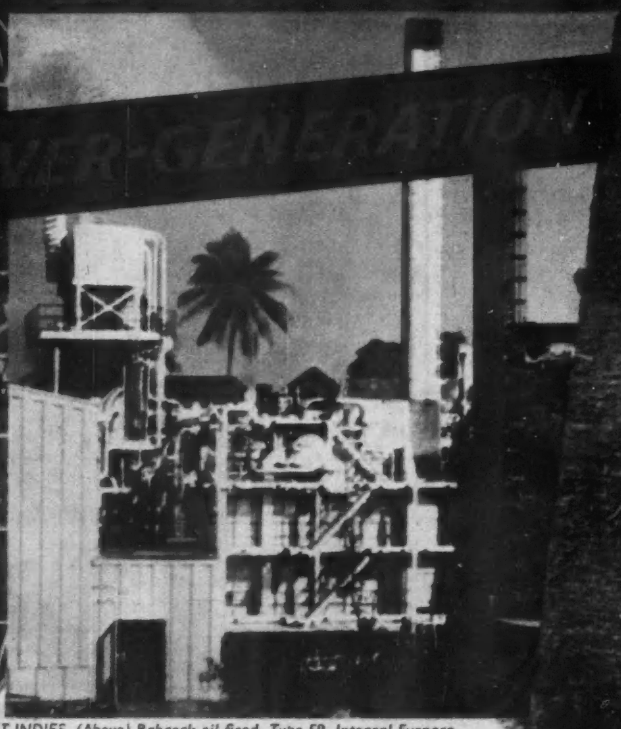
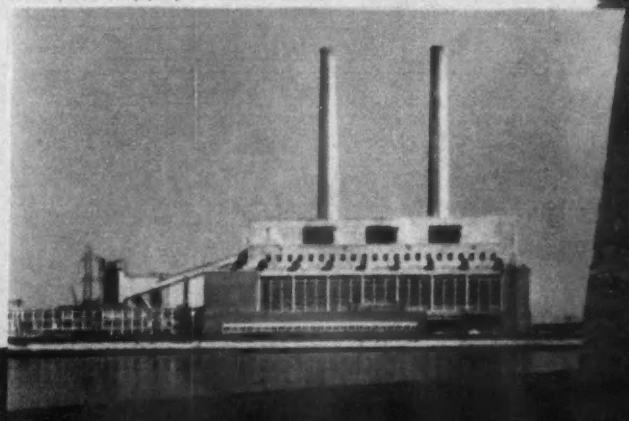
ELECTRICAL TIMES



WEST INDIES. (Above) Babcock oil-fired, Type FP, Integral Furnace boiler plant at Barbados Light and Power Co. Ltd. power station.

GREAT BRITAIN. (Below) Blyth 'A' power station, equipped with four 860,000 lb./hr. (120 MW) Babcock p.f. - fired Radiant boilers.



STEAM is, by far, the world's most important medium for electrical-power generation and a very high proportion of the world's power stations is equipped with BABCOCK steam-raising plant. Recent contracts for home and overseas central station boilers include units of 200, 300, and 550 MW capacity, a number to operate on a reheat cycle, and a 375 MW boiler of the "once-through" type to generate steam at supercritical pressure — 3650 lb./sq.in. and 1110°F, with reheat to 1055°F.

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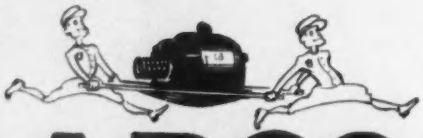

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ARCO Rewinds latest type Service Depot provides the fastest emergency electrical repair service for both A.C. and D.C. machines in Great Britain today.

RE-WINDING AND COMPLETE RE-BUILDING

is carried out by the most advanced and efficient methods—for all electrical machines from multi-speed motors to the largest and heaviest industrial generators and electrical equipment.

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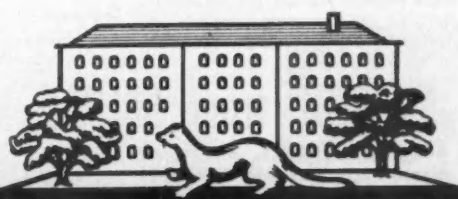

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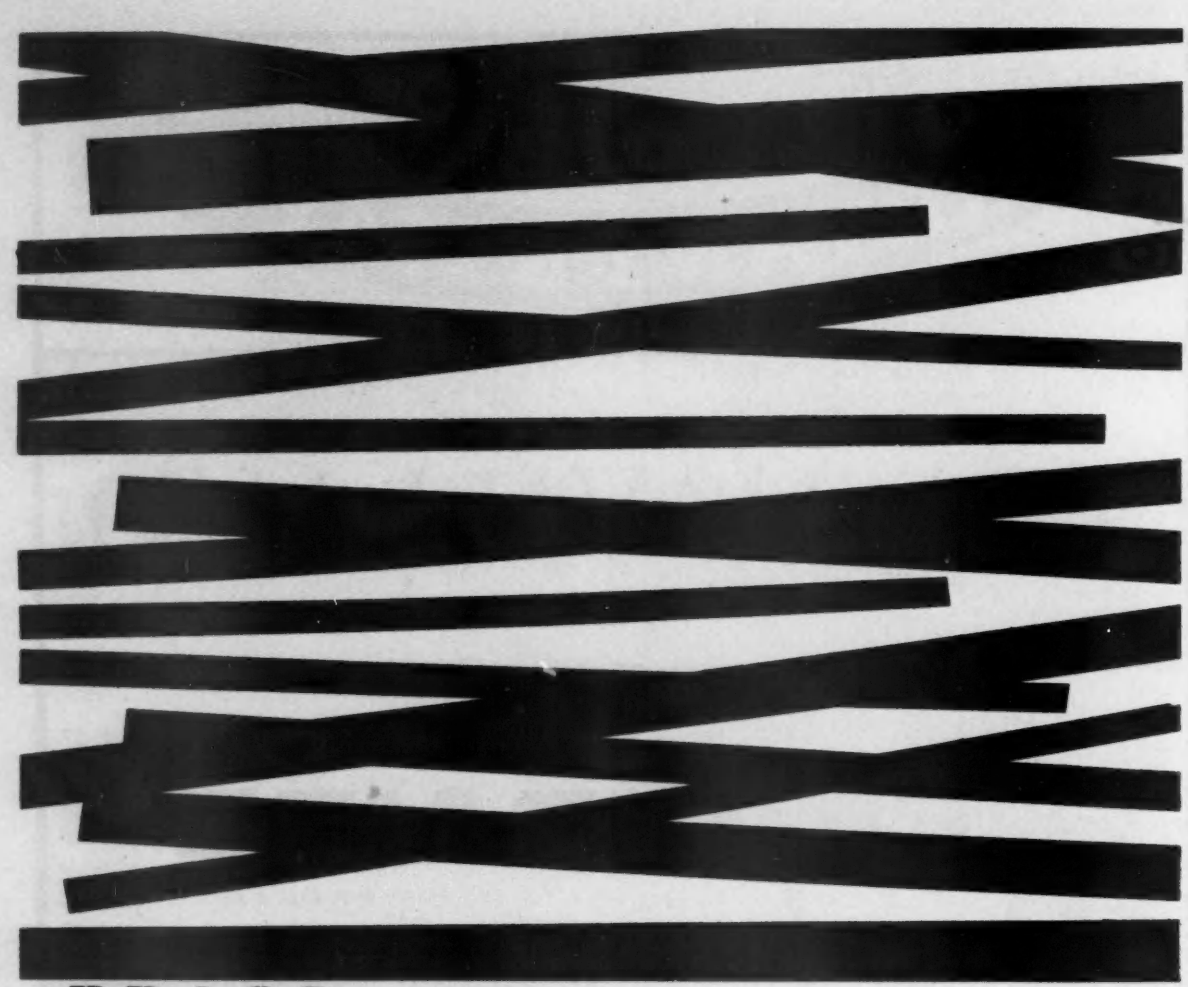

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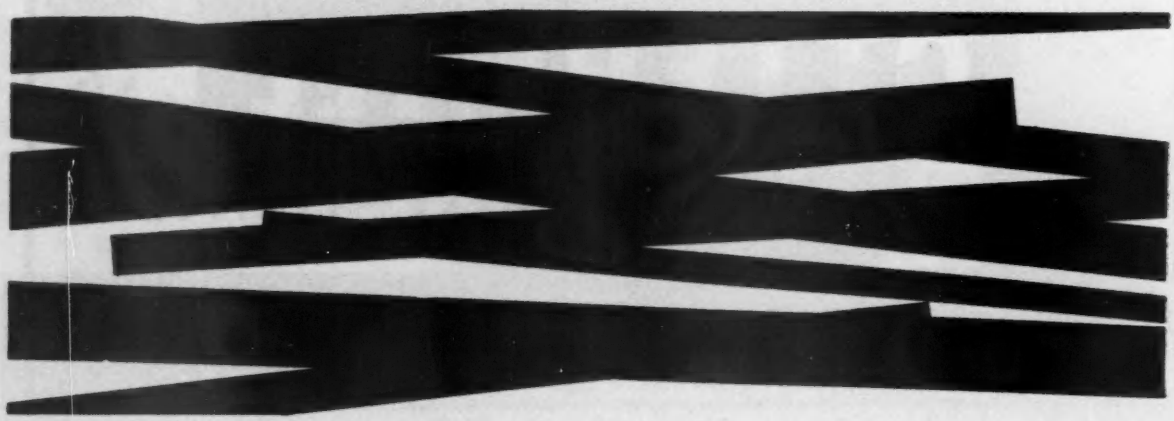
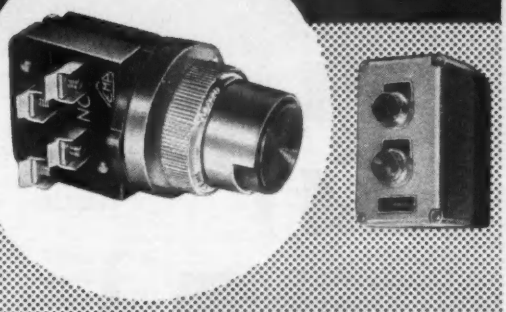
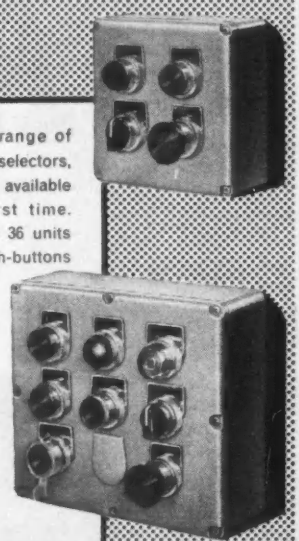


OIL-TIGHT CONTROL UNITS



The well-known CEMA range of heavy duty control units, selectors, pilot lights, etc., is now available in the U.K. for the first time. Control stations of up to 36 units can be supplied and push-buttons are interchangeable with most other popular units. Other CEMA products include: pedal switches, palm switches, limit switches, contactors, isolators, timers, latched relays, terminal blocks, solenoids and micro-switches.



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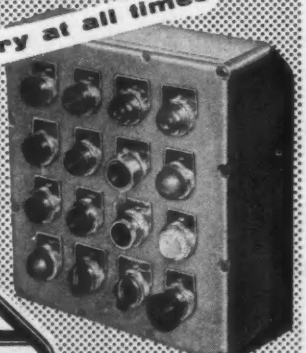

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Sole CEMA importers in the U.K.:

SHAWFORD CONTROL GEAR CO. LTD.,

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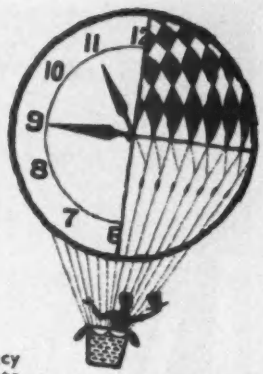
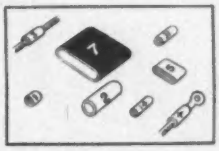
TIME WAITS FOR NO MAN!



Time must be saved, efficiency increased and costs cut in order to be competitive. Our range of economical, time saving equipment meets with all these needs. For instance, with our Strip Markers, 20 cables can be clearly and permanently identified in one minute.



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Available in comprehensive range of bore sizes and thickness. Cut to lengths and marked to your requirements. Supplied in P.V.C., Neoprene, or Natural Rubber, in a wide range of different colours.

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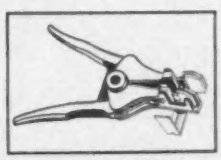
Over 550 different markers stocked. Self-adhesive and waterproofed. Visible from all angles. Stock holding reduced, as each marker is suitable for use with a wide range of cable diameters. Also supplied to specified markings.



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Synchronised with automatic release mechanism, avoiding any damage to fine wire cables. Compact and light-weight. Four alternative interchangeable blade sets available, for ⅛ to 9 mm dia. cables.

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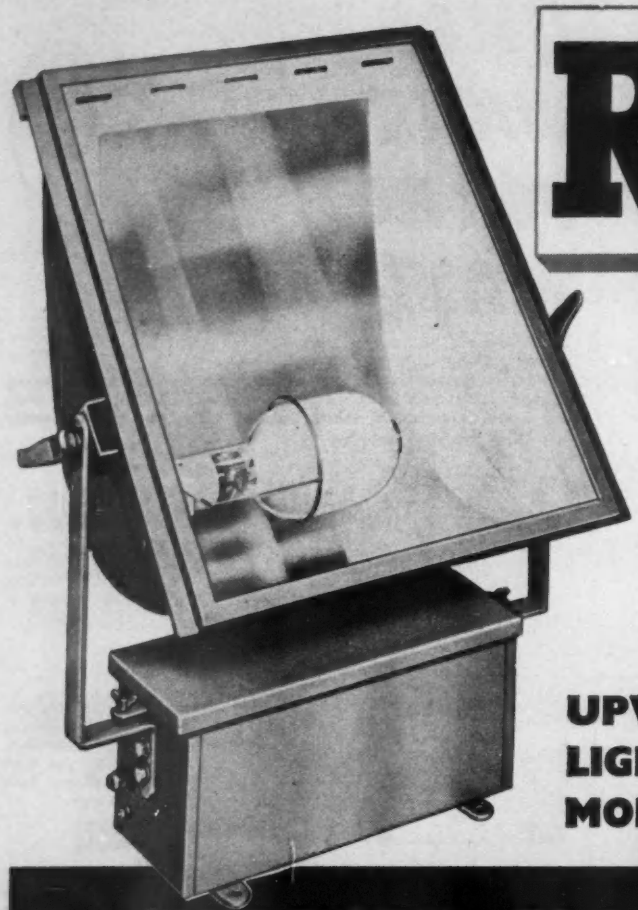

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UPWARD LIGHTING MODEL

MERCURY FLOODLANTERN

for 250/400 watt MBF/U Lamps

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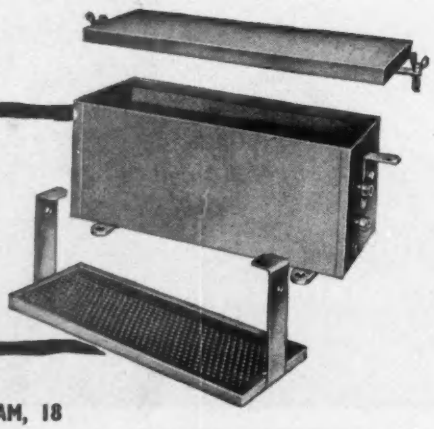
It is just one of the R.E.A.L. range of Floodlanterns comprising some fifty models and catering for practically every type and size of lamp.



'UNIVERSAL' CONTROL GEAR BOXES

List No. 1209. The perforated tray supplied with the R.E.A.L. Box greatly facilitates gear mounting.

Each Box fitted with packed glands for incoming and outgoing cables.

Have you yet received your copy of LIST P.6004?

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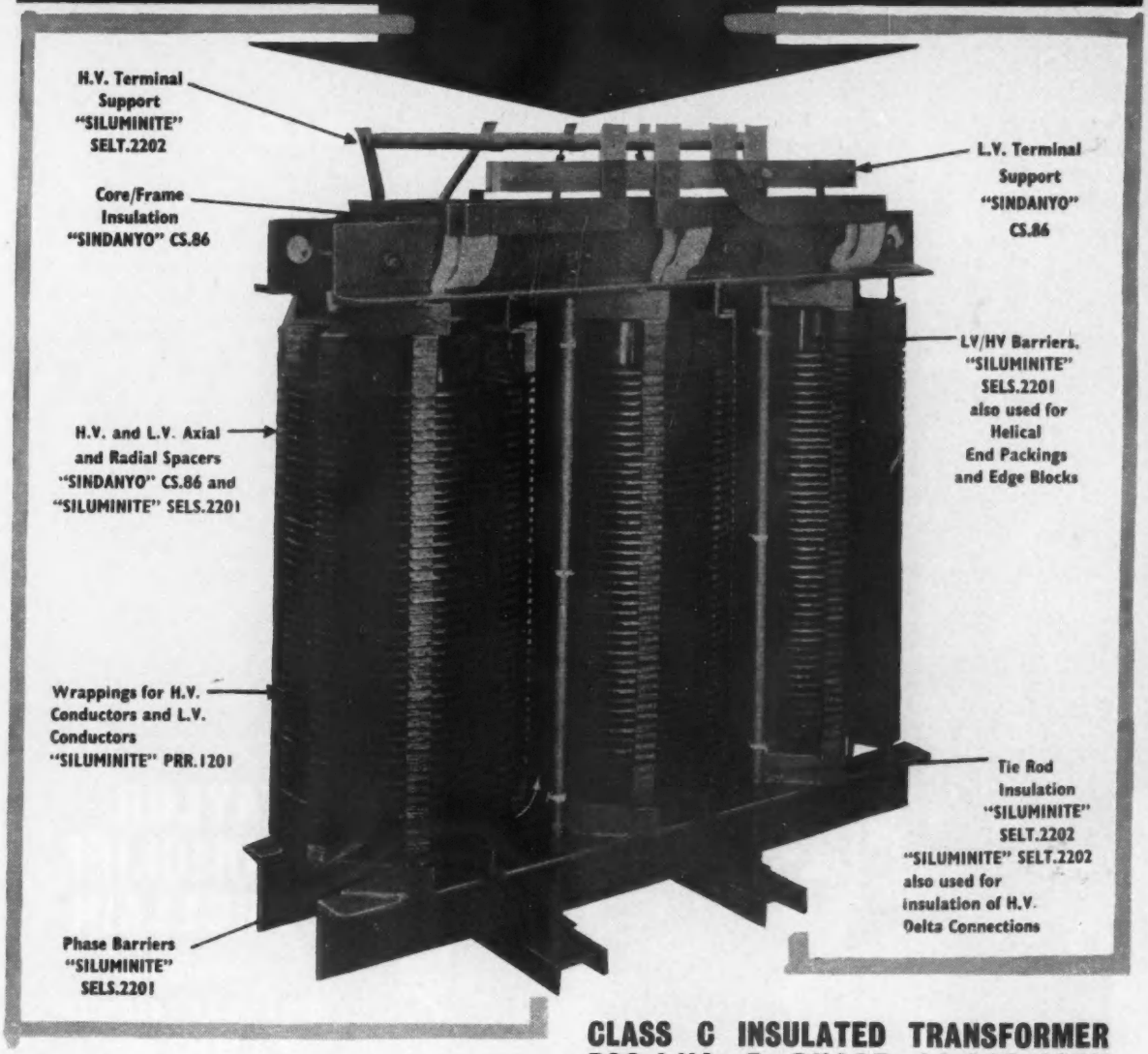
H.V. Terminal Support "SILUMINITE" SELT.2202
Core/Frame Insulation "SINDANYO" CS.86
H.V. and L.V. Axial and Radial Spacers "SINDANYO" CS.86 and "SILUMINITE" SELS.2201
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"SILUMINITE" SELT.2202 also used for insulation of H.V. Delta Connections

CLASS C INSULATED TRANSFORMER 500-kVA 3 PHASE 11,000/433V

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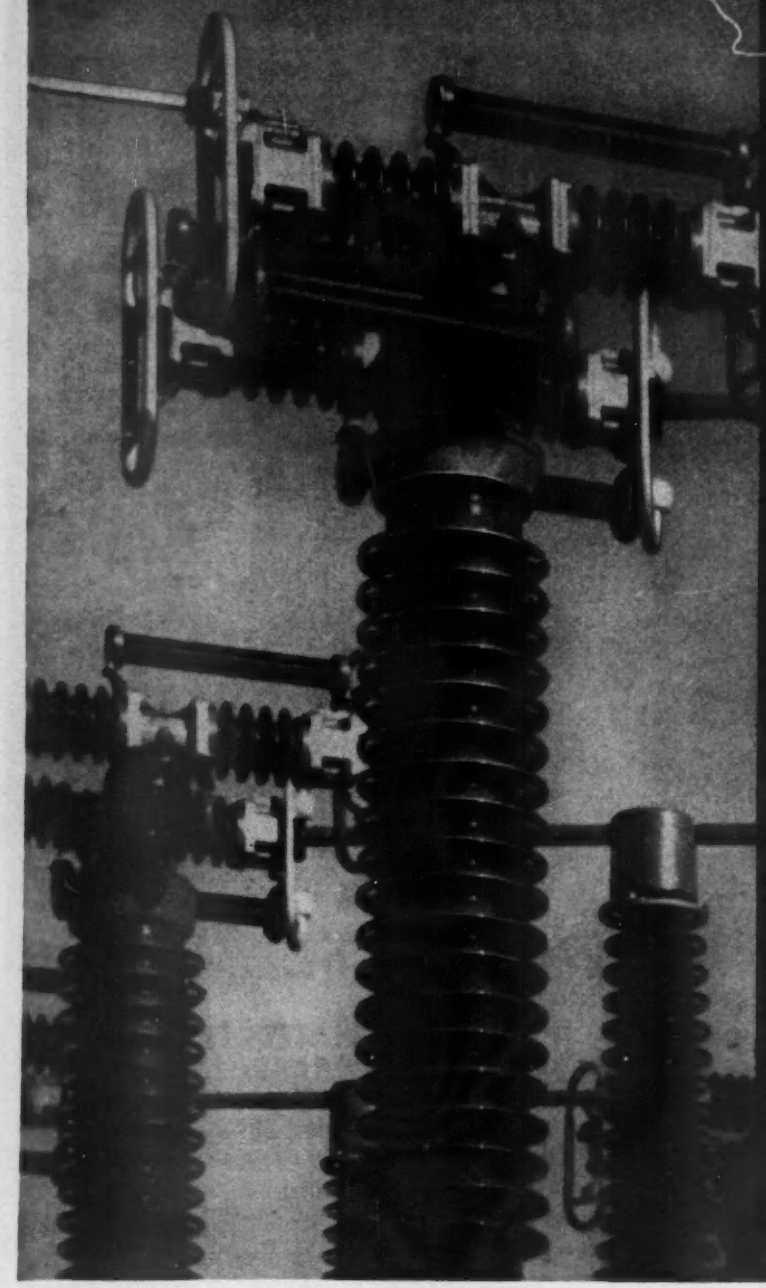
529

Insulation in a BIG way



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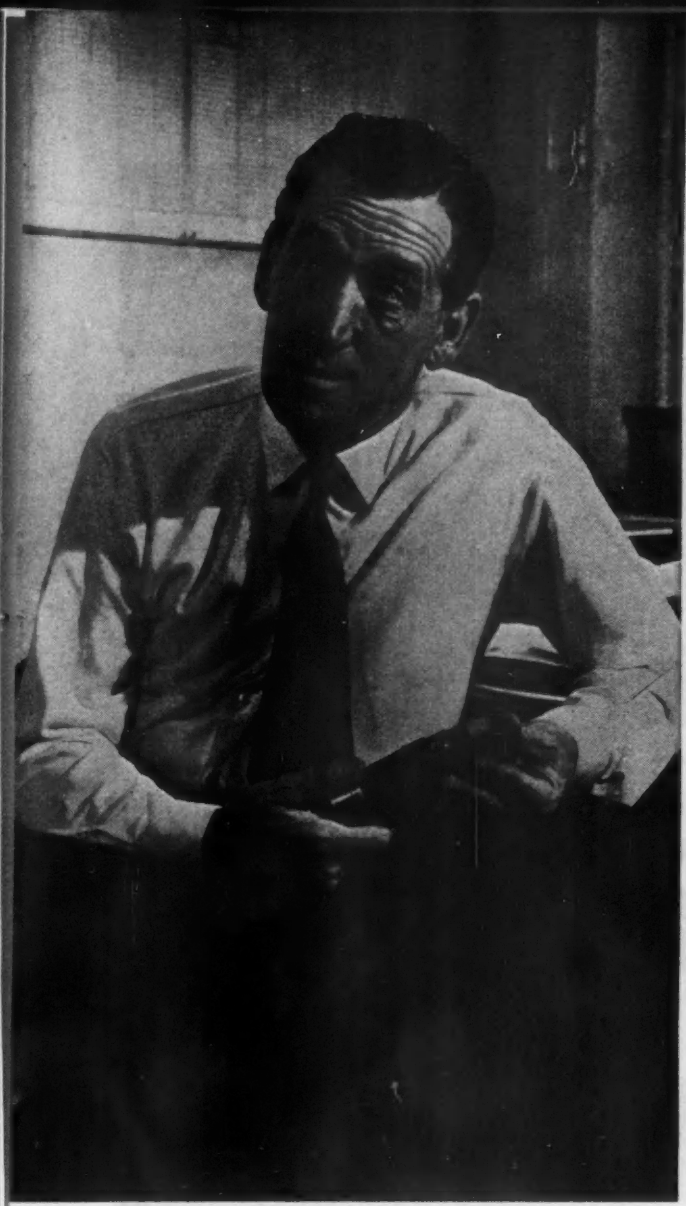

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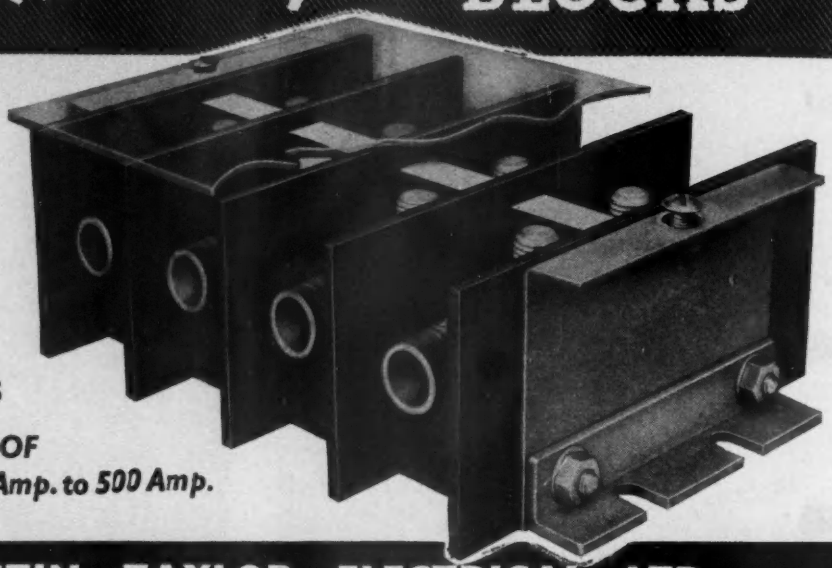

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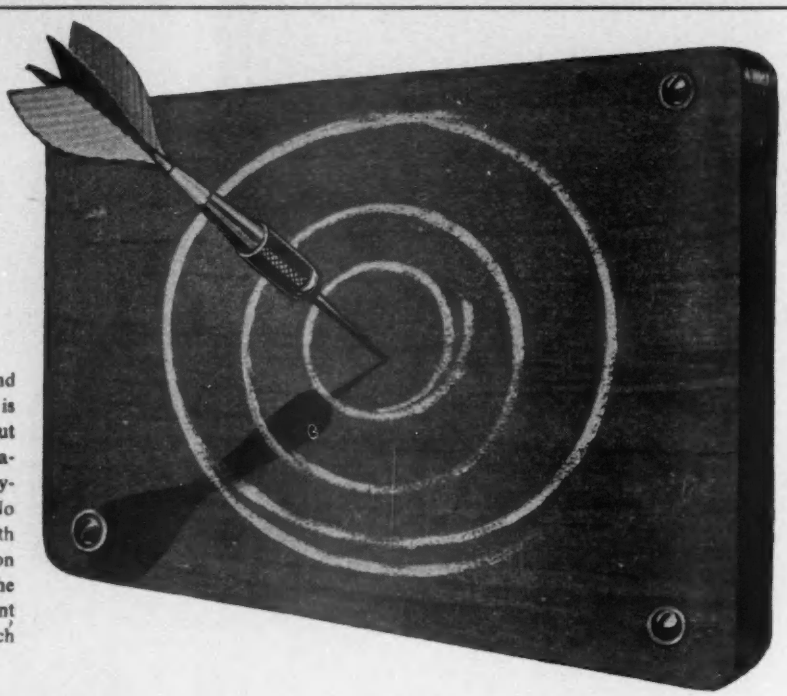

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WOOTTON–the meter board people

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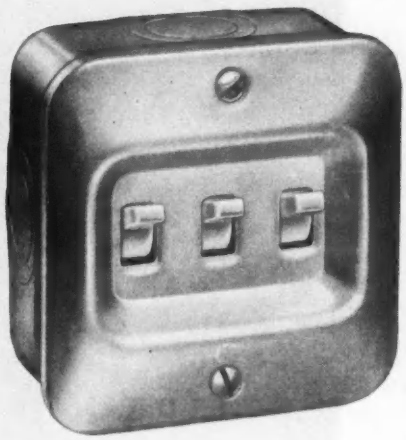

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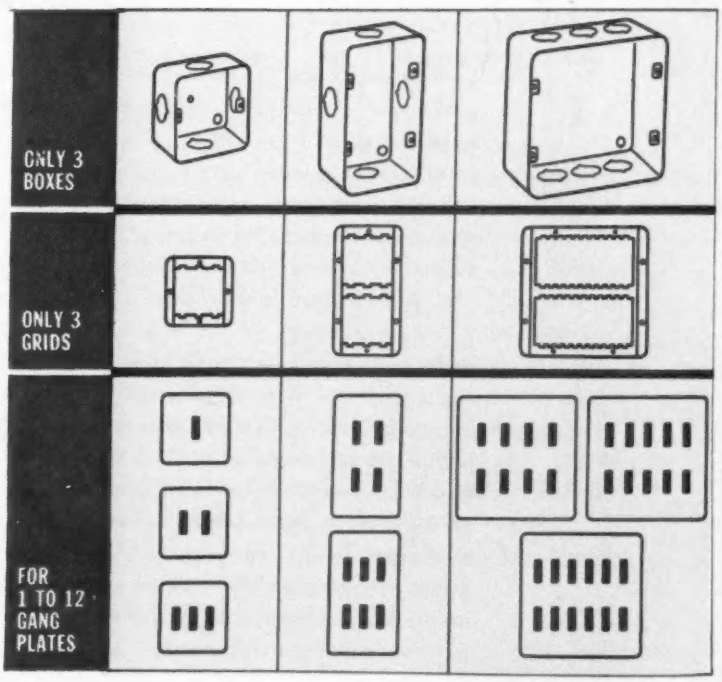

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10 TIMES BETTER OFF WITH CLASS H MOTORS

If the insulation system of one electric motor lasts ten times as long as that of another—it's something you should know about! So here are the plain facts about Class H Motors.

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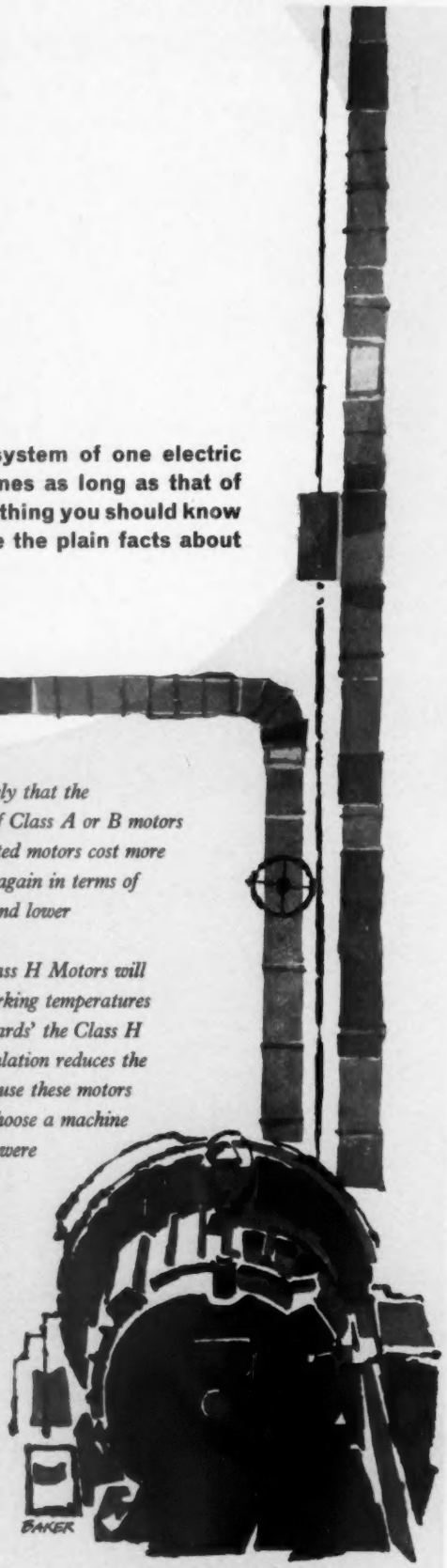
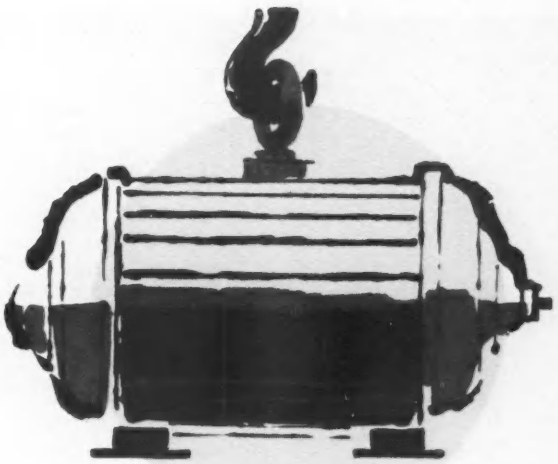
***No** matter how testing the working conditions, Class H Motors will take the strain. High humidity levels . . . high working temperatures . . . heavy overloads. All these 'occupational hazards' the Class H Motor can take in its stride since MS silicone insulation reduces the risk of breakdown to the very minimum. And because these motors are so resistant to overload, it's often possible to choose a machine of lower capacity than if a Class A or B machine were being used. Result—still further economies.*

***So** don't imagine that the Class H Motor is in the 'luxury' class . . . something to be specified only in exceptional conditions. On the contrary, a silicone-insulated motor is today's first choice—no matter what the circumstances!*

MS





REMEMBER SILICONES FOR REWINDS TOO

The value of silicone insulation is by no means restricted to new machines. Many a troublesome Class A or B motor—given to repeated breakdowns—has been totally transformed by a timely silicone rewind.

At the Latchford Locks Works of the British Aluminium Co. Ltd. a centrifuge, used for cleaning aluminium swarf, is powered by a 15 HP motor which is mounted beneath the centrifuge. To help in the cleaning, live steam at about 10 psi is admitted to the centrifuge while it is in motion. The motor, when new in 1954, was wound with Class A insulation, but failed after eight months due to condensation on the windings. Rewound with Class A it failed again—this time after only two weeks' service. To prevent repetition of these failures the motor was then rewound using silicone insulation, and in fact ever since it was recommissioned in May 1955, British Aluminium report, 'the centrifuge has been used almost constantly without further trouble with the motor windings'. They go on to say, 'There is no doubt that the employment of silicone insulation has greatly lengthened the trouble-free working of the winding of this motor.'

***Amongst** the leading manufacturers of Class H motors are: Associated Electrical Industries (Rugby) Ltd · The English Electric Co Ltd · The General Electric Co Ltd · Bruce Peebles & Co Ltd · Woods of Colchester Ltd · Brook Motors Ltd · Lancashire Dynamo & Crypto Co Ltd · Brush Electrical Engineering Co Ltd · Howells Electric Motors Ltd · Laurence, Scott and Electromotors Ltd.*

For a list of names of the many rewinders experienced in the use of silicone insulation, contact your nearest Midland Silicones branch office.

All over Britain, MS silicones are strengthening the weak link in electrical equipment—its insulation. Midland Silicones Ltd manufacture a full range of silicone products for use in the electrical industry. And Midland Silicones Ltd consistently set the pace for progress in this fast-developing field.

MS **MIDLAND SILICONES LTD** ***first** in British Silicones*

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There are over 100 different types of switch available for use in almost any liquid.

Please ask for Brochure ET.M.160.

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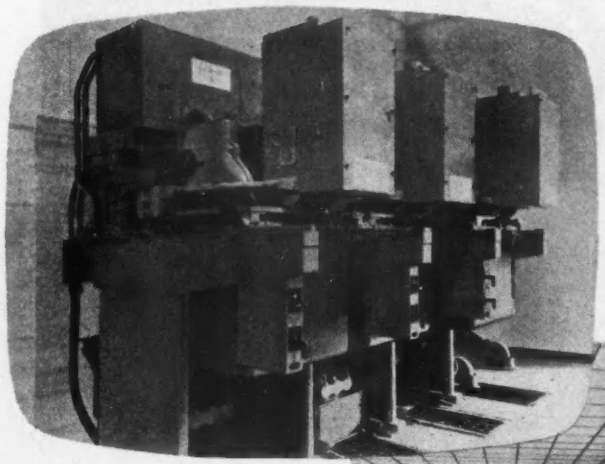
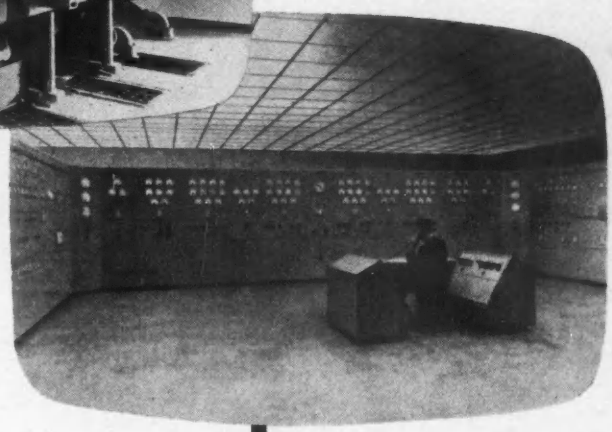


Photographs by courtesy of the U.K.A.E.A.



generator switchgear at Calder Hall

The generators at the Calder Hall Power-station of the Atomic Energy Authority are controlled by Reyrolle 11-kV 500-MVA and 750-MVA switchboards and their associated control-boards

Reyrolle equipment is also installed at:

Capenhurst,
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A MEMBER COMPANY OF THE NPPC NUCLEAR POWER PLANT CO. LTD.

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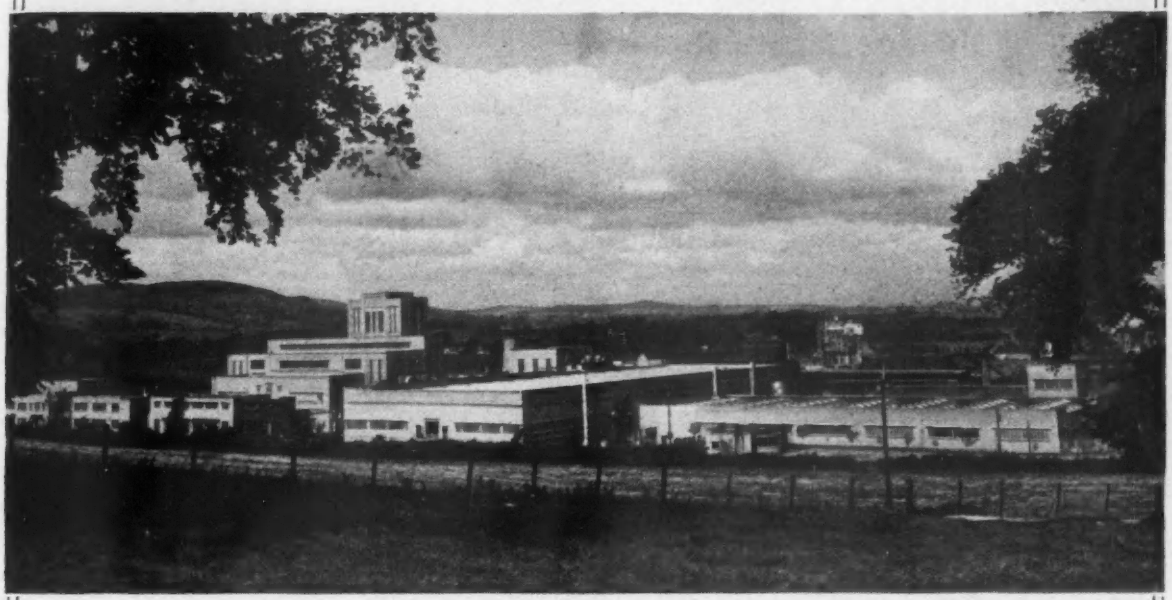
More 'Melinex' in 1961



I.C.I. build new plant to produce 2,000 tons of 'Melinex' film per year

IN JANUARY 1961, a new 'Melinex' polyester film plant will start production at Dumfries with a rated capacity of 2,000 tons/year. I.C.I., who are the sole manufacturers of polyester film in this country, have been selling 'Melinex' for some years. The demand has increased rapidly and I.C.I. have been allowing imports of American and Continental film to supplement their limited production. The new plant will remove the necessity for such imports.

More and more firms are appreciating the outstanding properties of 'Melinex' film. Its unusual clarity and strength (both mechanical and electrical) combined with its great dimensional stability and resistance to heat and chemical action, are improving a very wide range of products throughout industry.

Where 'Melinex' film is now being used:

The Electrical Industry—in coils, capacitors, cables, recording tapes and loudspeakers.

Drawing Offices—as a flexible, durable and dimensionally stable drafting film.

Display—in metallised form for tinsel and as coloured tapes and panelling.

The Book Trade—for protecting covers and as a base for hot stamping foils.

Footwear & Leather goods—in metallised form for shoes and fashion accessories.

The Food Industry—for improving the sales appeal of goods and for 'boilable' packs.

The range of uses for this versatile film will widen considerably in 1961. If you would like further information or wish to discuss a possible application for 'Melinex' film, please write to I.C.I. Their Technical Service staff will be pleased to give advice and technical assistance.

'Melinex'

'Melinex' is the registered trade mark for the polyethylene terephthalate film manufactured by I.C.I.

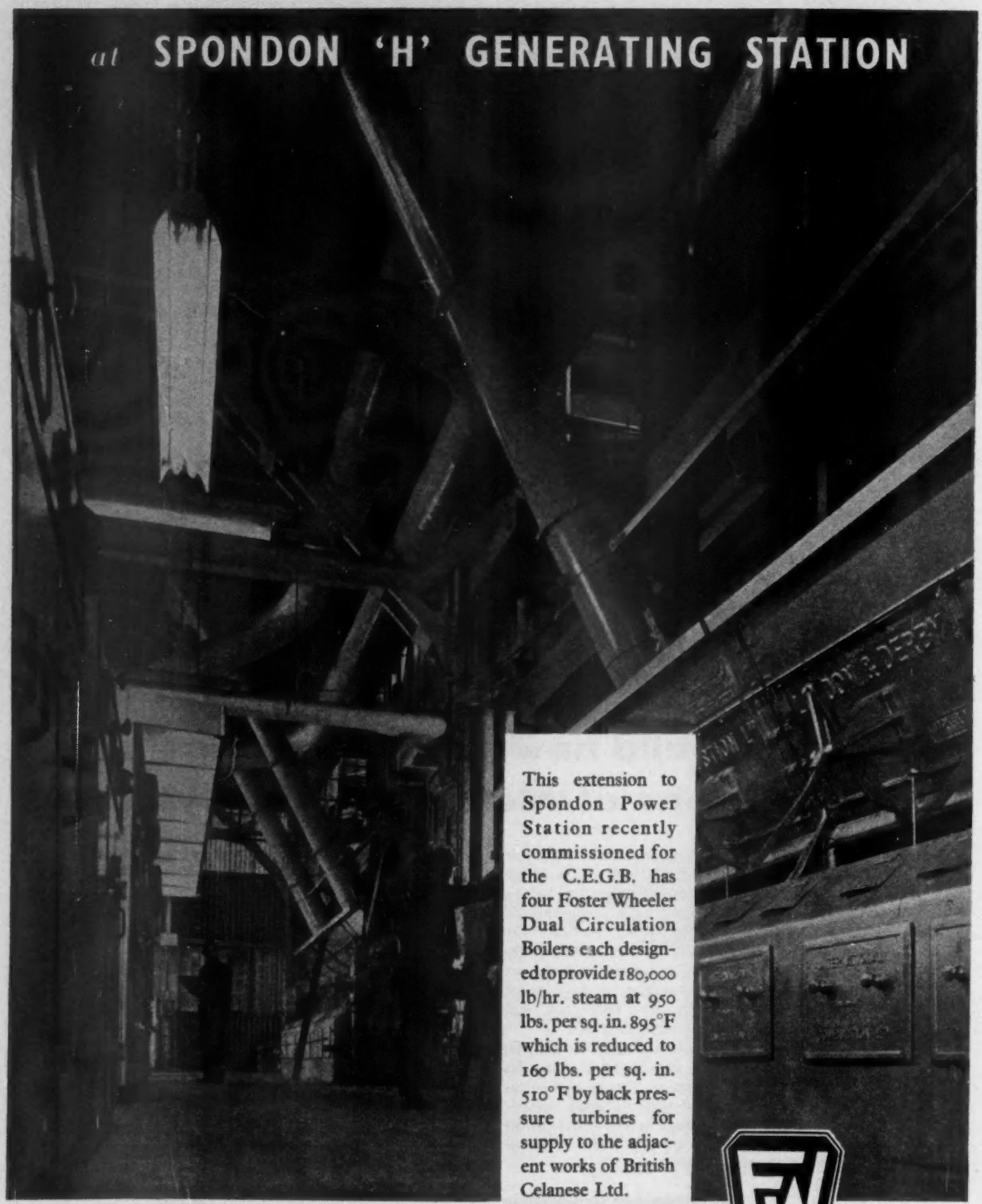
ICI

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.I

PME I

FOSTER WHEELER DUAL CIRCULATION BOILERS

at SPONDON 'H' GENERATING STATION



This extension to Spondon Power Station recently commissioned for the C.E.G.B. has four Foster Wheeler Dual Circulation Boilers each designed to provide 180,000 lb/hr. steam at 950 lbs. per sq. in. 895°F which is reduced to 160 lbs. per sq. in. 510°F by back pressure turbines for supply to the adjacent works of British Celanese Ltd.

Photograph by courtesy of the Central Electricity Generating Board

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FOSTER WHEELER HOUSE, CHAPEL STREET, LONDON, N.W.1. Telephone: PADdington 1221

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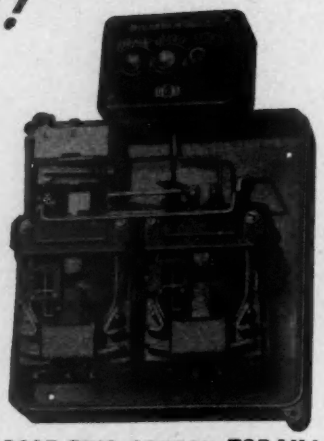
Our direct-on-line reversing starters have proved highly efficient in service. They give continuous trouble free operation with minimum servicing.
The Starters consist of two four-poles Contactors, one for each direction, electrically interlocked, and can be supplied for either Air Break or Oil Immersed, with or without Overload Protection Unit. Built-on Push Button Station is optional. The Overload Protection Unit is of the Thermal Bimetal Type self re-setting, or hand re-set. The Contactors are of the butt type, silver contacts being fitted to the Air Break Models.
Oil Immersed Models have copper contacts.
Illustrated is starter with built-on push button station suitable for squirrel cage motors up to 7½ h.p. Heavy duty starters available for controlling motors up to 30 h.p.



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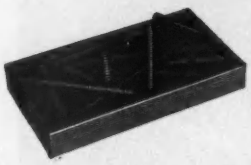
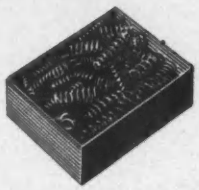
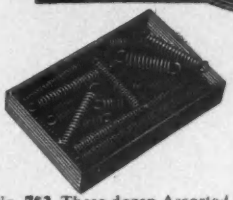


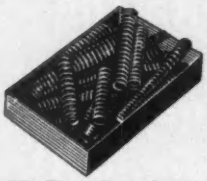
No. 1200. Three dozen Assorted Light Expansion Springs, suitable for carburettor control, etc. **15/-.**



No. 98A. Three dozen Assorted 1" to 4" long, ¼" to ½" diam., 19G to 15G. **6/6.**

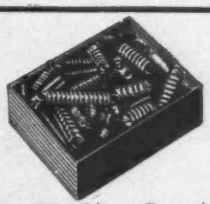


No. 753. Three dozen Assorted Light Expansion ½" to ½" diam., 2" to 6" long, 22 to 18 S.W.G. **12/-.**



No. 760. Three dozen Assorted Light Compression Springs. 1" to 4" long, 22 to 18 S.W.G., ¼" to ½" diam. **7/6.**

No. 757. Extra Light Compression. 1 gross Assorted, ¼" to ⅝" diam., ½" to 2½" long, 27 to 19 S.W.G. **18/-.**



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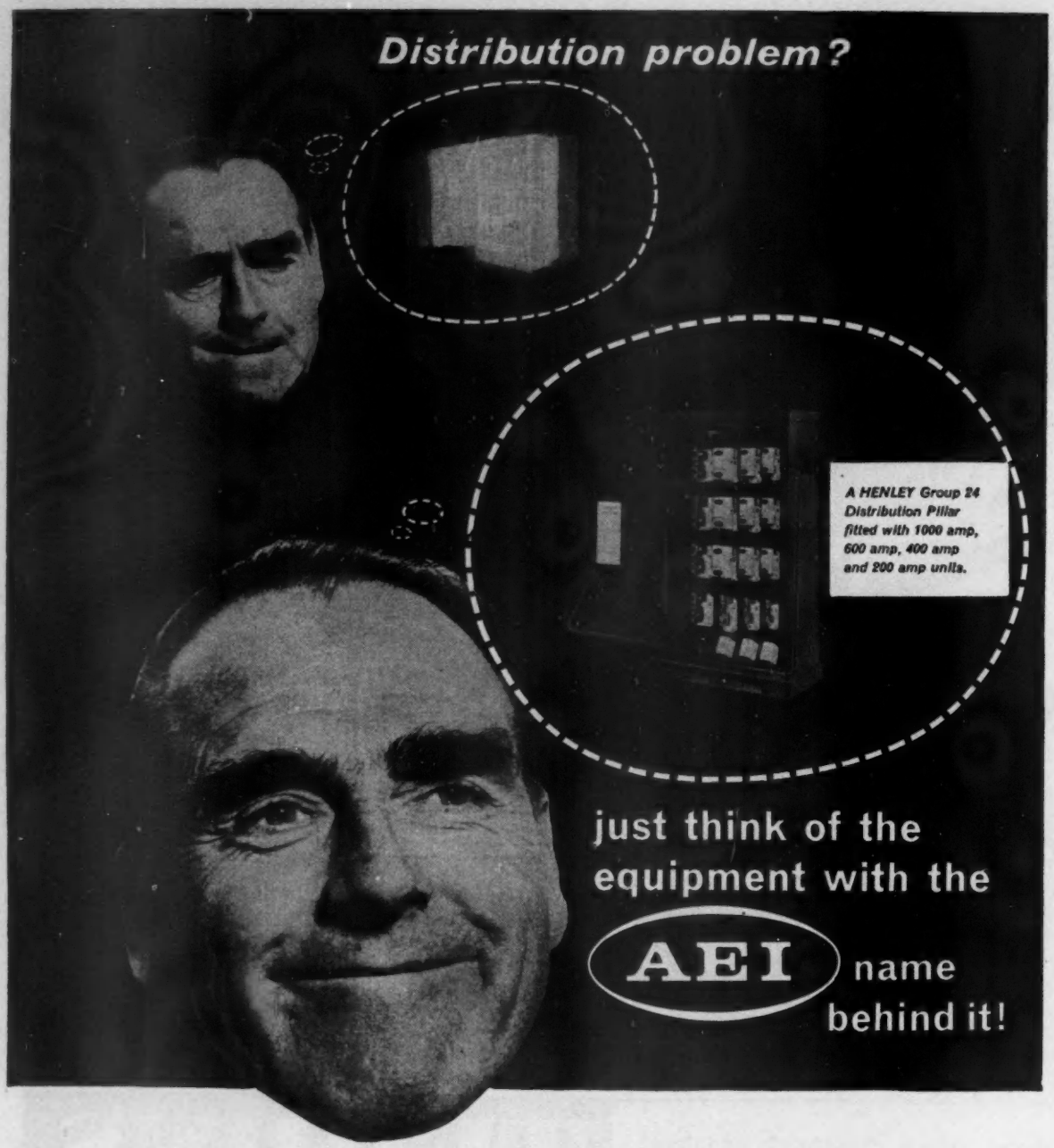
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NEWS SHEET

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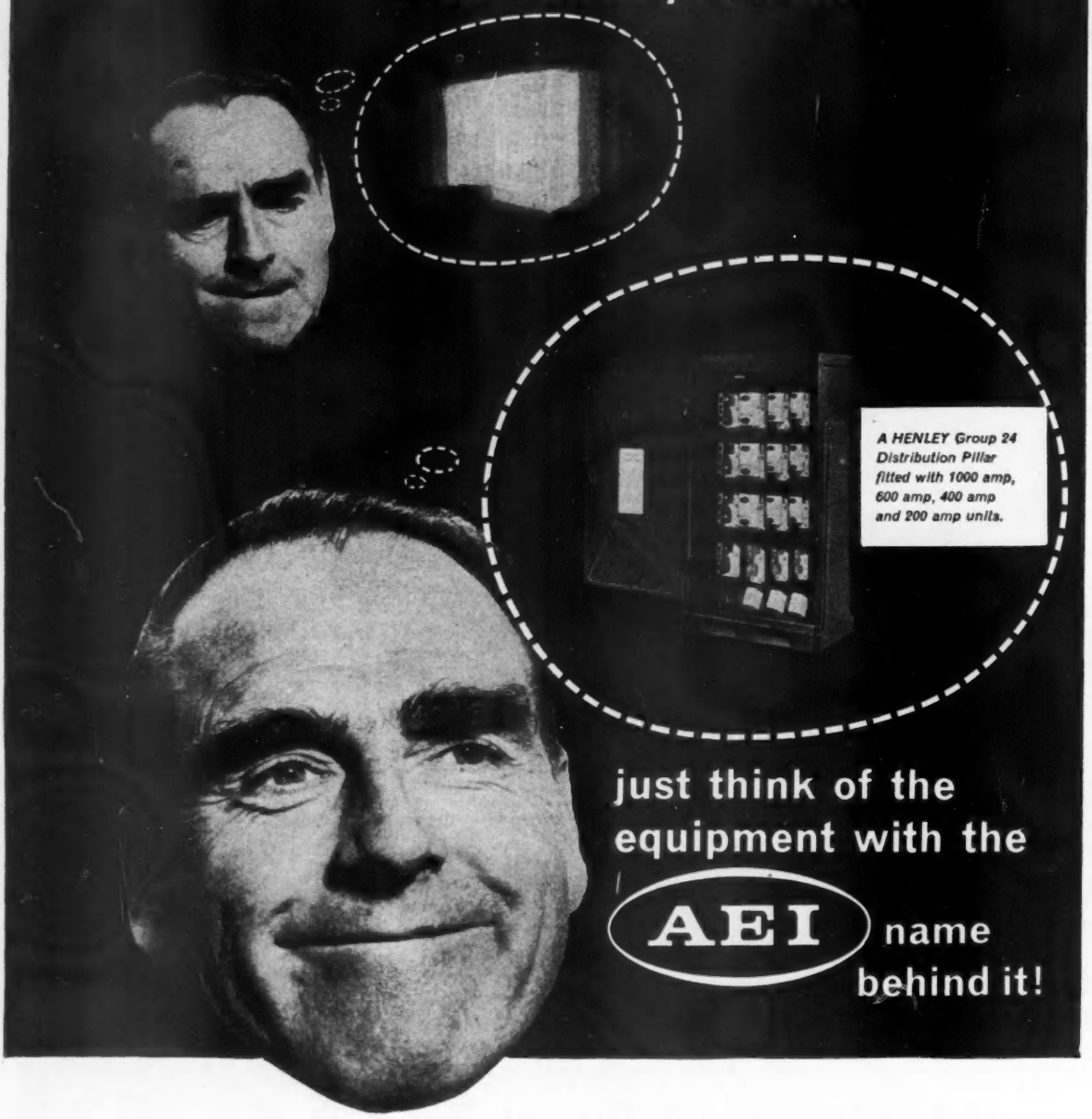

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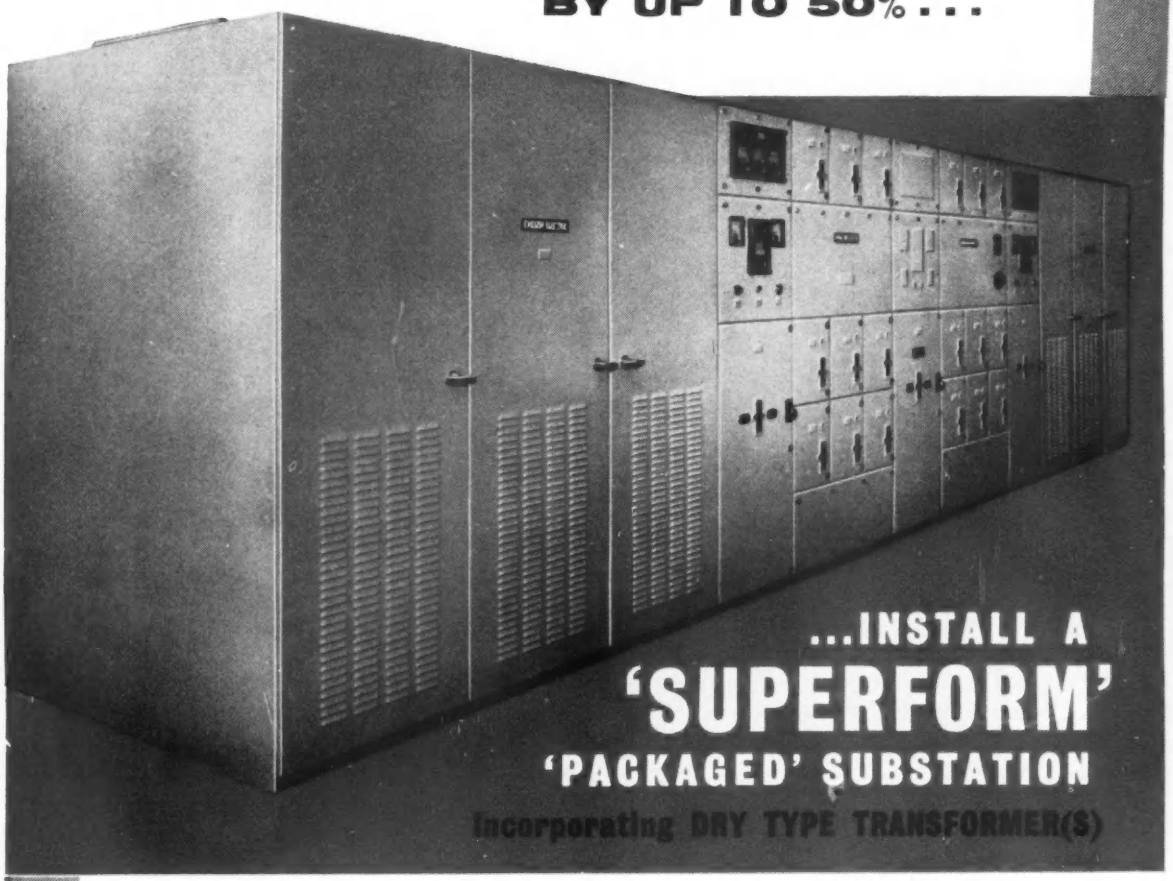

The illustration shows a 'Superform' 'Packaged' Substation for a large chemical works. Two 1,000 kVA Class 'C' dry type transformers are incorporated, one at each end of the equipment. The medium voltage switchboard is supplied through two air circuit-breakers, and the outgoing circuits are controlled by on-load h.r.c. fuse-switches.

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C

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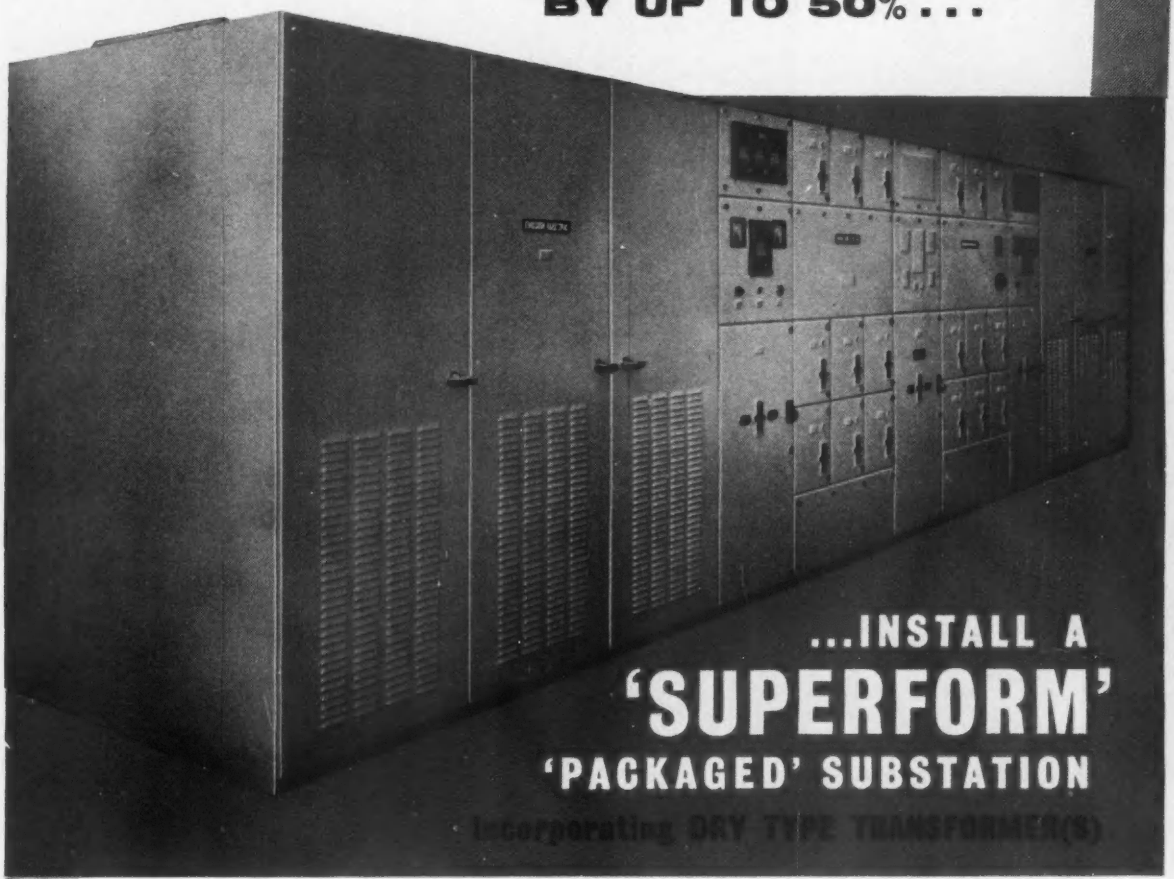

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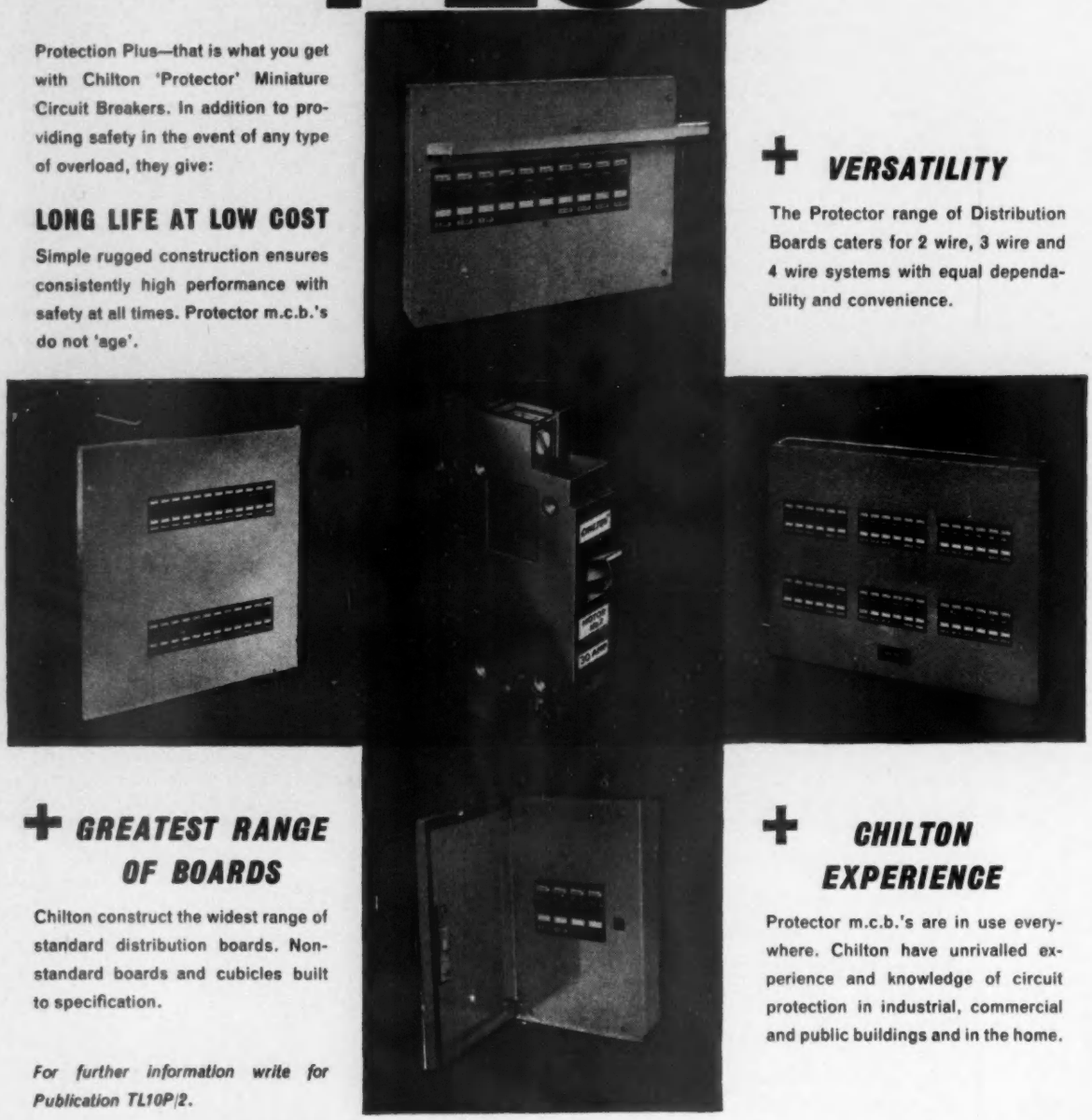

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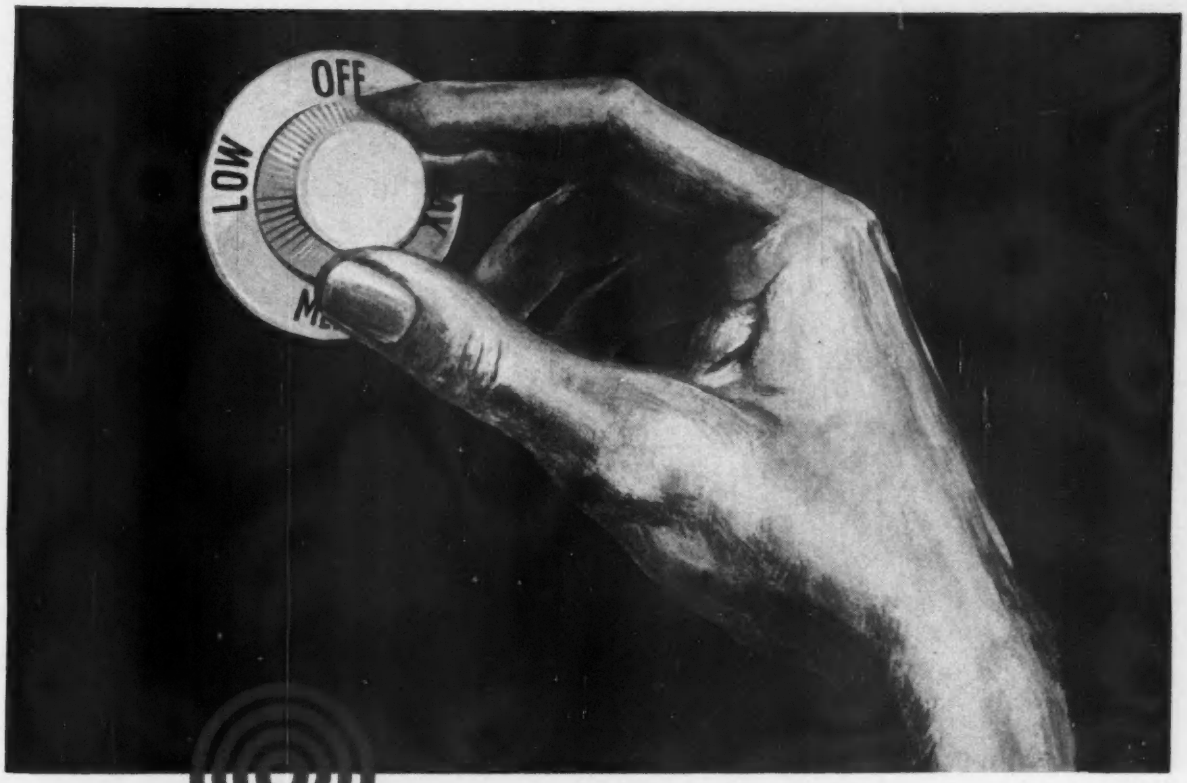

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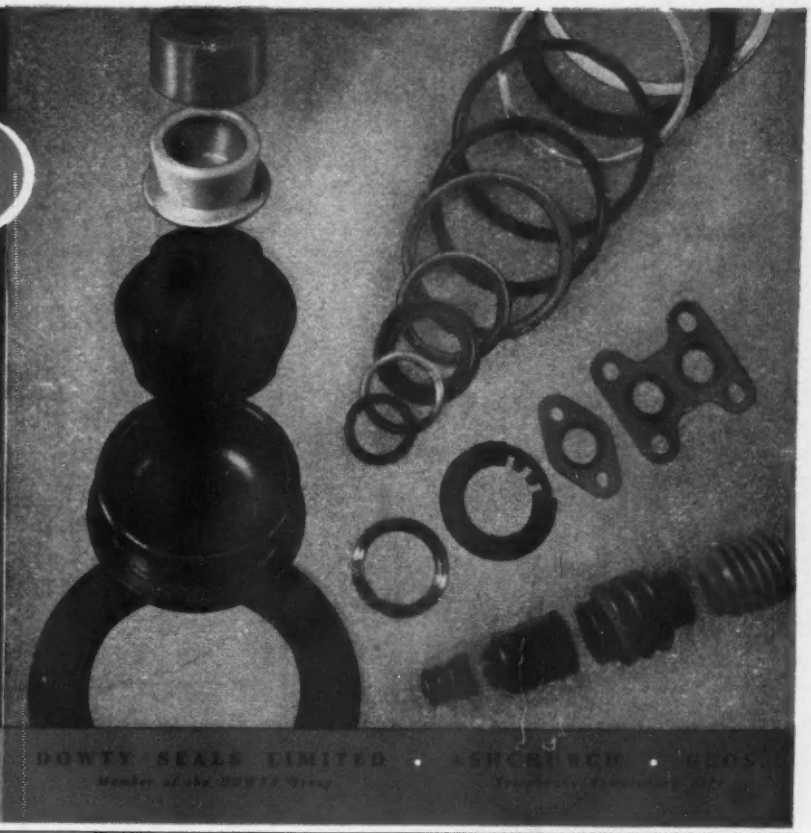

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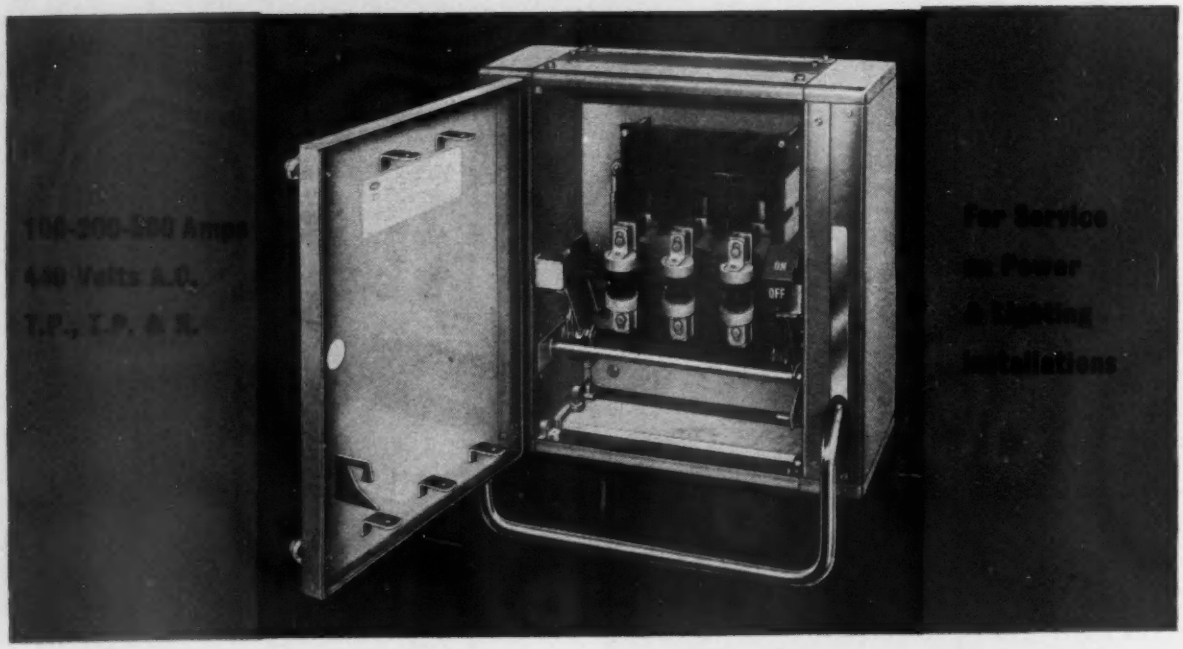

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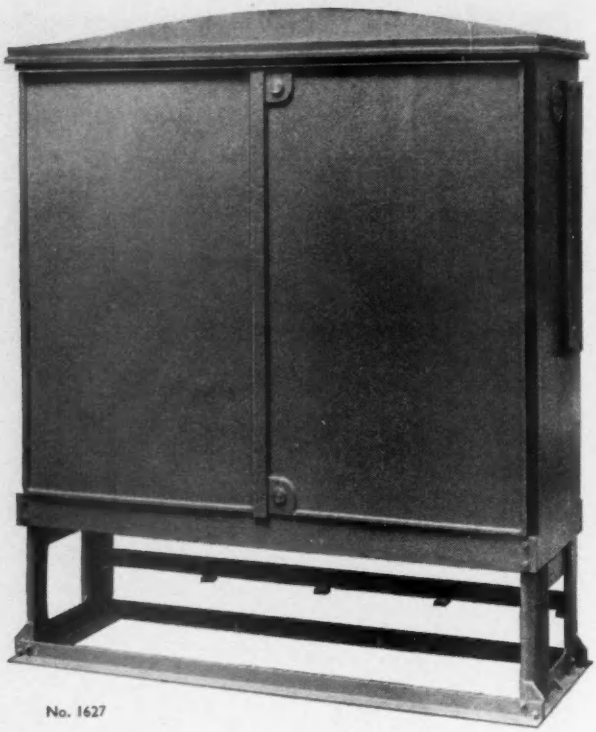

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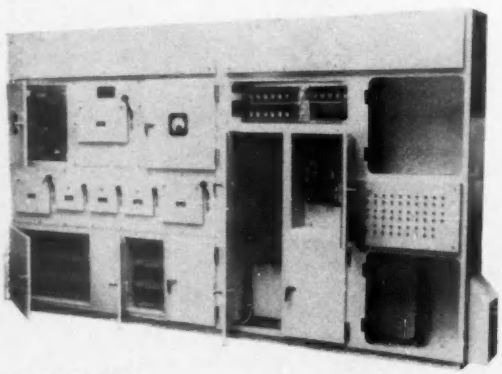

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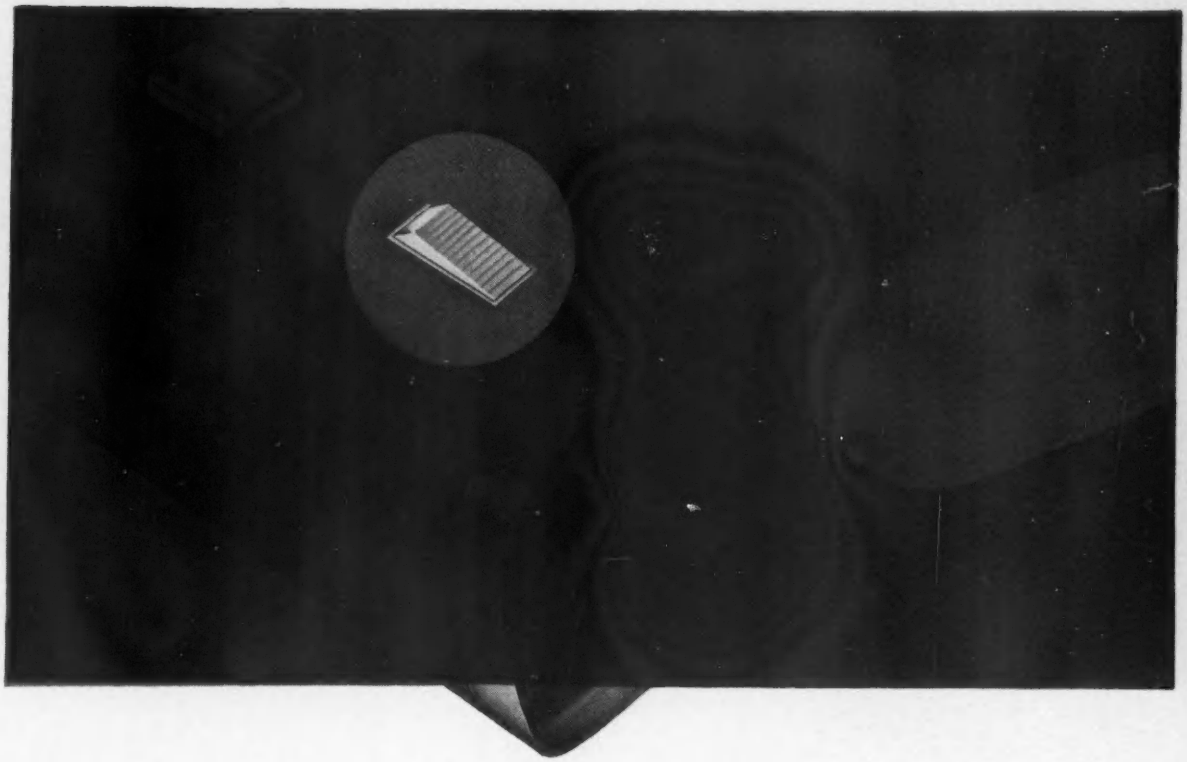

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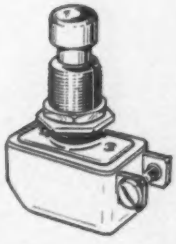

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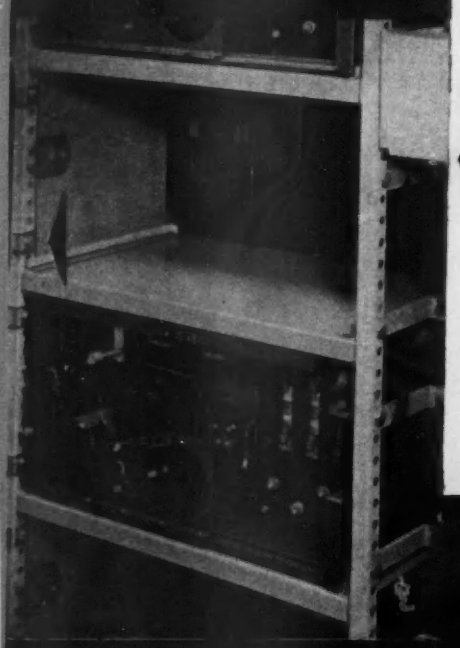

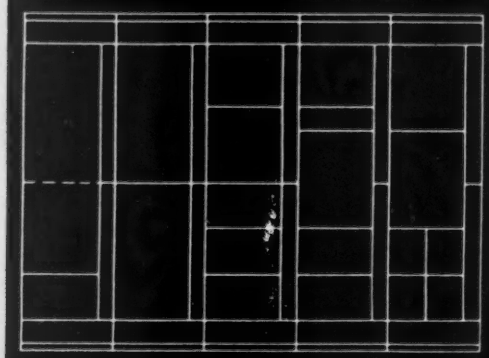

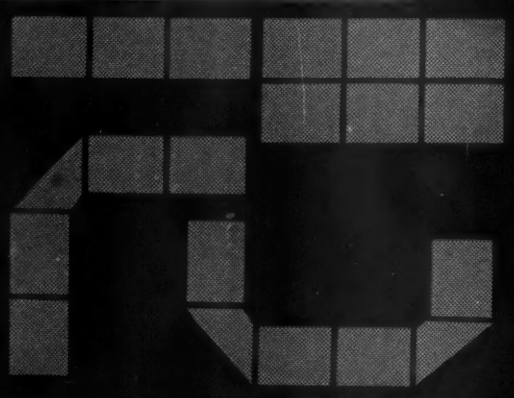

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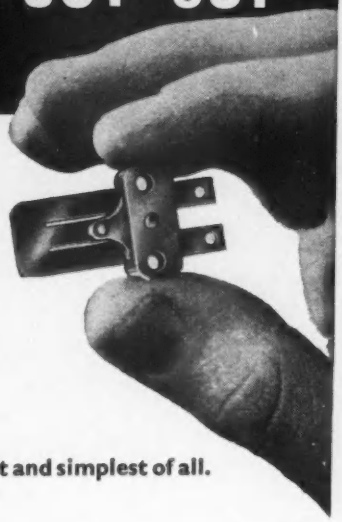

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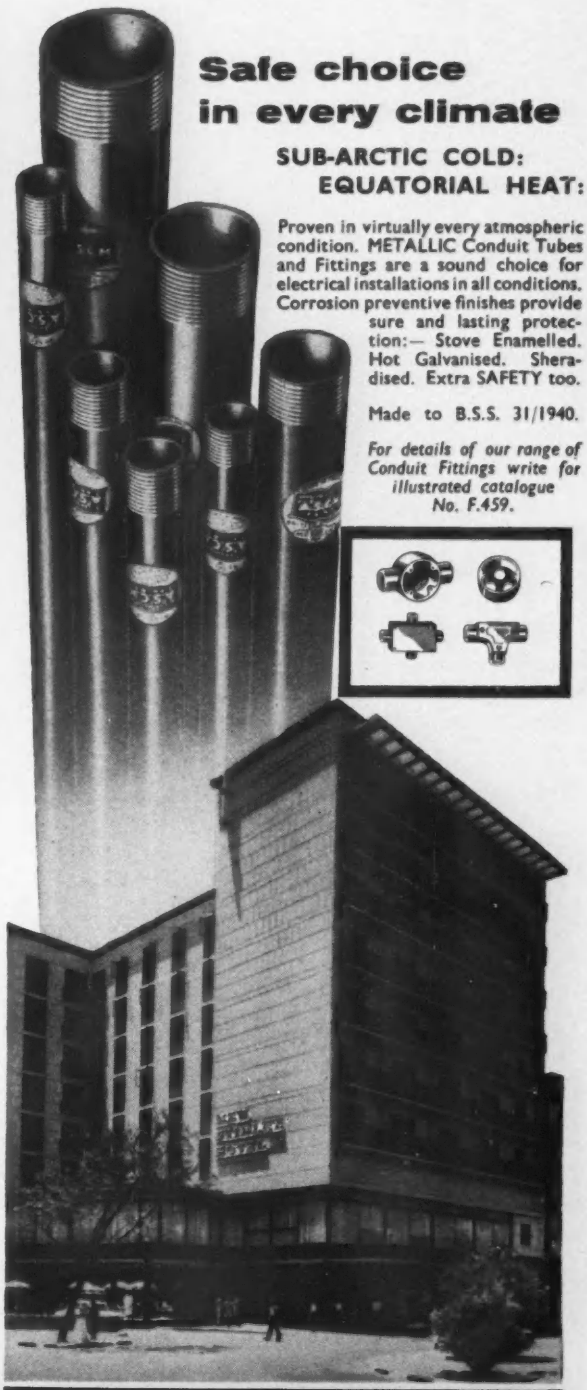

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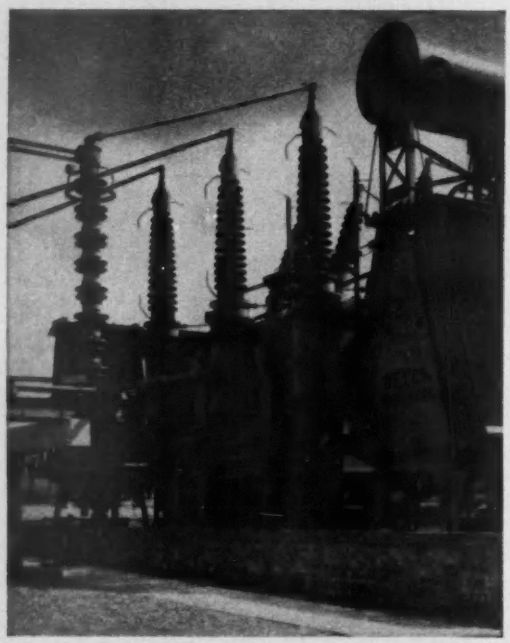
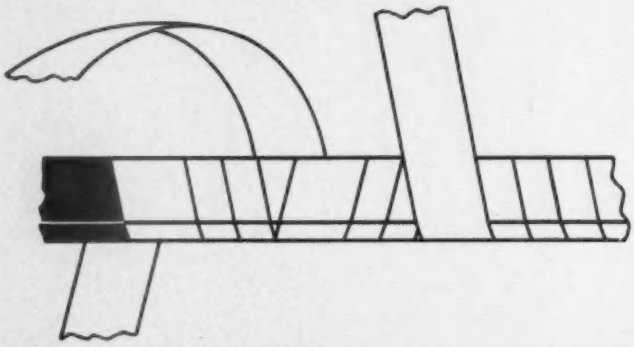


Engineers use the word performance in two senses, a limited one which refers to parameters that can be specified and checked; and a wider, vaguer, but essentially more realistic sense which covers freedom from trouble, ease of servicing, adaptability and many other things. Performance in the first sense is reproducible by any competent manufacturer; it depends on designing to well-established principles. Performance in the second sense is the basis of choice between manufacturers. It comes from countless small differences in design that are based on . . .

This thing called know-how



Know-how shows up most clearly in detail. Often a very small detail. Take, for example, the lapping of the paper insulation of a transformer winding. We have learned how vital it is that the paper should be so lapped that no subsequent handling can disturb it. To this end we use narrow paper—never wider than ⅜ in.—and instead of butting the edges of each turn we overlap half the width. Alternate layers or sets of layers are wound in the opposite lay. This gives us a remarkably solid wrapping, though it takes considerably longer to do. Finally, conductors intended for heavy multiple-conductor, spiral windings are served with a layer of cotton over the paper covering to provide mechanical protection. It is attention to details such as these that gives our transformers their enviable reputation for reliability.

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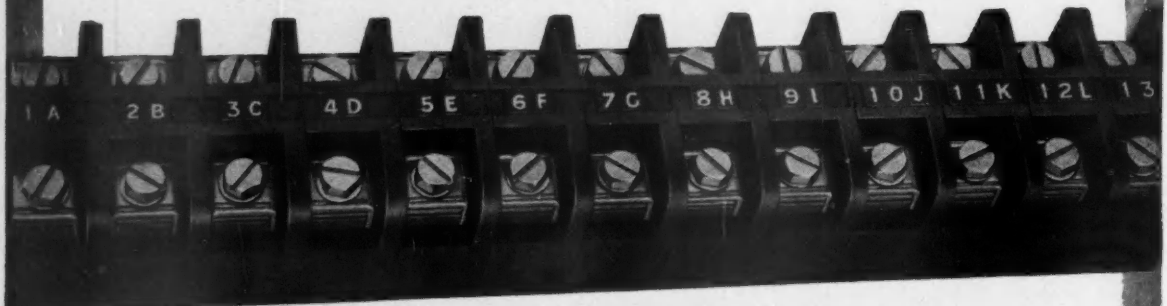
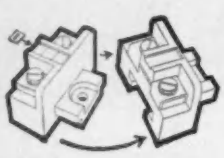


M·T·E MULTI-LOCK TERMINAL BLOCKS



With Multi-Lock you can build up complete terminal block assemblies consisting of any number of single units you choose. They are available in three ratings (15, 40 and 100 amp.) and can be mounted to any surface without special brackets or channels. The 40 amp. and 100 amp. blocks also interlock with one another to give two different ratings in one assembly. All Multi-Locks meet B.S.I. and C.S.A. specifications.

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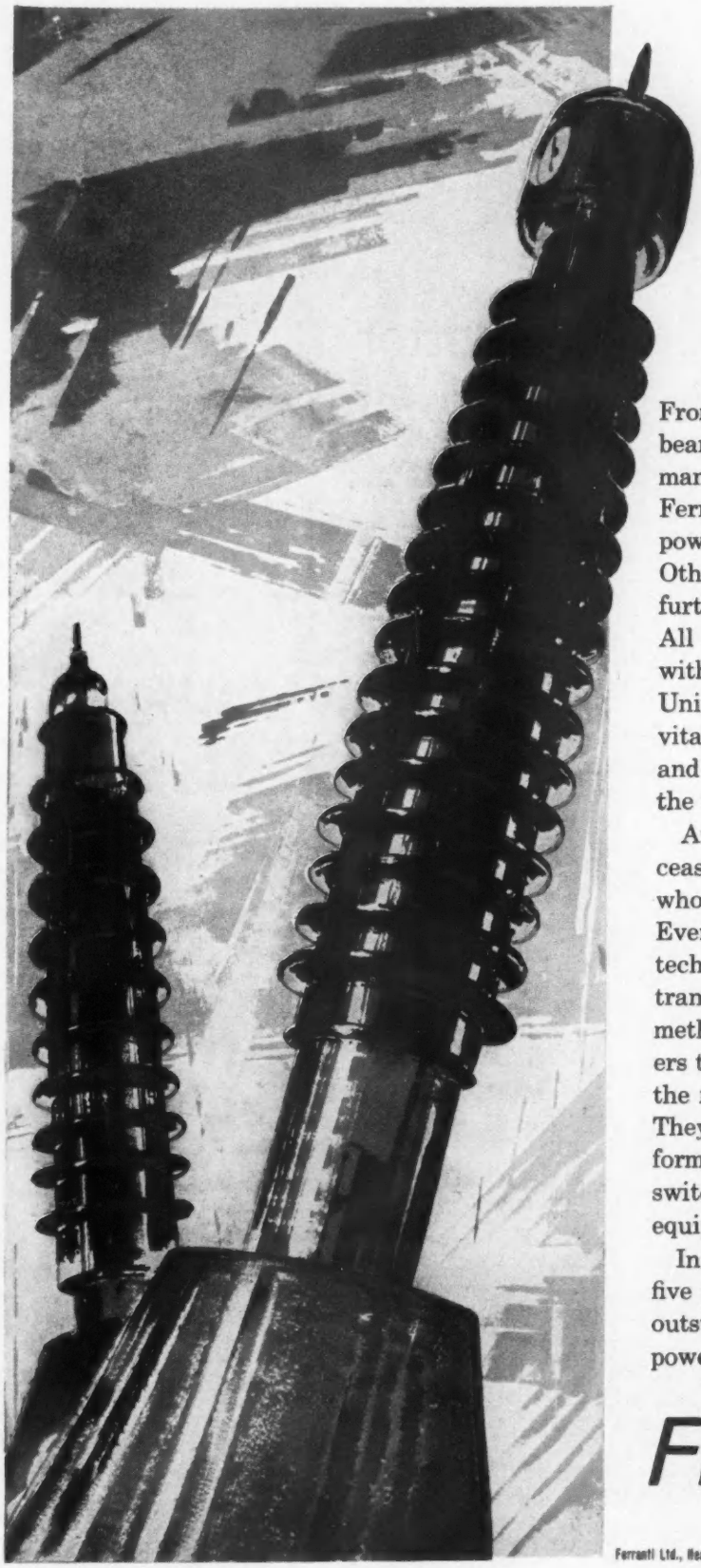

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From the huge auto-transformers that bear our name, the cables stretch in many directions to link with yet more Ferranti equipment. Some connect with power station controls and switchgear. Others carry on across country to meet further transformers of lesser degree. All terminate, in one way or another, with some form of metering device. United, these Ferranti products play a vital part in the British 'grid' system and in the supply of electricity all over the world.

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THURSDAY 2 FEBRUARY, 1961
Registered as a Newspaper Volume 139 No. 5

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Générateurs thermo-électriques 163

Il est possible de relier les uns aux autres des semi-conducteurs type n et type p pour former des générateurs thermo-électriques ayant un rendement beaucoup plus élevé que la chose serait possible en utilisant des métaux différents. Pour la production en grand d'énergie électrique par voie thermo-électrique on a besoin de matériaux capables de fonctionner à une température de plus de 1100°C. Pour le moment, on peut compter sur un rendement global de 6%, mais on espère doubler ce rendement d'ici cinq ans.

Éclairage fluorescent domestique 167

L'éclairage fluorescent devient de plus en plus populaire à la maison. Les dessinateurs d'appareils d'éclairage fluorescent cherchent maintenant à fournir des appareils qui puissent se monter à la place des appareils d'éclairage par filament de tungstène—des appareils que l'usager puisse, au besoin, installer lui-même en les branchant sur des douilles ordinaires.

Câble de 400 kV 171

On a fait l'épreuve d'un câble à âme unique et rempli d'huile de 400 kV. L'épreuve a porté sur les extrémités exposées à l'air libre puis en bain d'huile, sur un joint d'arrêt et sur un joint de raccordement. Le câble comporte un isolement au papier de 23,7 mm d'épaisseur radiale, et peut supporter des tensions d'impulsions de l'ordre de 1400 kV. Le câble proprement dit, ses raccords et ses extrémités ont été éprouvés à des impulsions de 1600 kV. On s'est servi, pour ces épreuves d'un nouveau laboratoire d'essais. Il est muni d'un générateur d'impulsions de 2200 kV et de transformeurs de 50Hz donnant des tensions qui peuvent atteindre 666 kV.

In dieser Nummer

Thermoelektrische Stromerzeugung 163

Halbleiter vom "n" Typ und "p" Typ lassen sich zu thermoelektrischen Generatoren mit einer weitaus höheren Leistung verbinden, als es bei andersartigan Metallen der Fall ist. Für die thermoelektrische Stromerzeugung im großen Umfange ist Material erforderlich, das bei Temperaturen über 1100° C leitungsfähig ist. Gegenwärtig ist eine sechsprozentige Gesamtleistung möglich. Man hofft jedoch, diese im Laufe der nächsten fünf Jahre zu verdoppeln.

Leuchtstoffbeleuchtung für das Haus 167

Leuchtstoffbeleuchtung im Hause erfreut sich zunehmender Beliebtheit. Fassungskonstukteure für Leuchtstoffbeleuchtungen sind dabei, Fassungen zur Verfügung zu stellen, die auf dem Prinzip der Fassungen für Wolframbeleuchtungen beruhen und bei Bedarf vom Gebraucher sowohl angeschlossen als auch von Steckdosen gespeist werden können.

Kabel für 400 kV 171

Ein ölgekühltes Einleiterkabel für 400 kV wurde mit Freiluft und ölgekühlten Endverschlüssen einschließlich einer Sperrund Direktverbindung untersucht. Das Kabel hatte eine Papierisolation von 23,7 mm Radialstärke und wurde konstruiert, um Stoßspannungen von 1400 kV auszuhalten. Das Kabel mitsamt Verbindungen und Verschlüssen wurde mit 1600 kV Impulsen geprüft. Die Prüfungen wurden in einem neuen Laboratorium durchgeführt, das mit einem 2200kV Stoßgenerator und Kraftfrequenz-Prüfgeneratoren ausgerüstet ist, die Spannungen bis zu 666 kV ermöglichen.

Thermoelectric Generation 163
by J. W. Gardner, B.SC., PH.D., M.I.NUC.E.

Theme in Lighting Design 167
by P. T. Rodd, L.I.S.A.

Canadian Generation, 1960 170

Oil-filled Cable for 400 kV 171

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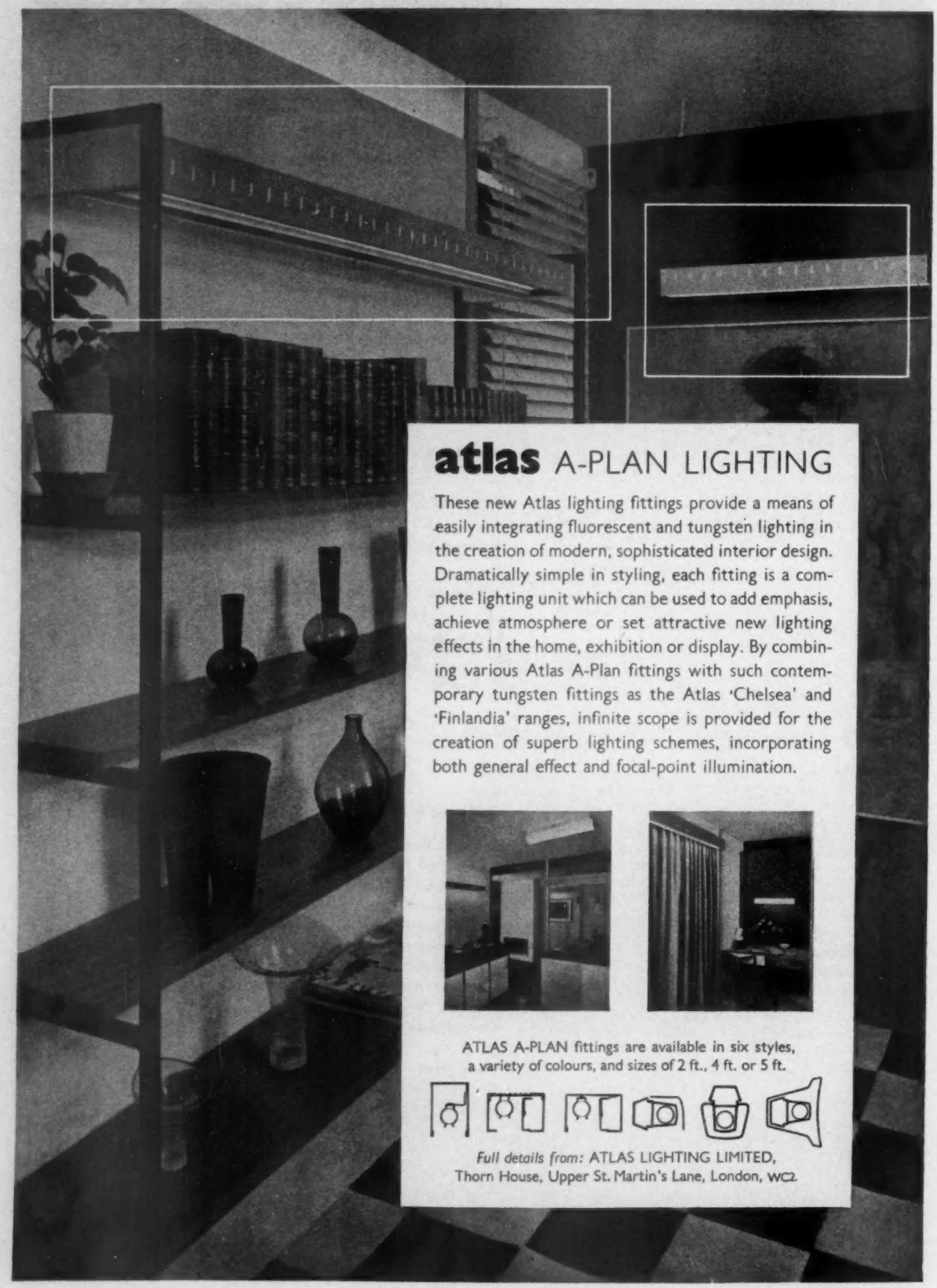
SUBSCRIPTION RATES: United Kingdom £4, Overseas £4 10s per annum. Canada and USA $12 per annum. Subscriptions are payable in advance and may commence with any issue. Overseas subscriptions may be paid by banker's draft, cheque, international money order or credited to the Electrical Times Ltd., at Coutts and Co., 440 Strand, London WC2. Single copies price 1s 6d. Postage 6d.

A NEW CONCEPT IN DECORATIVE FLUORESCENT LIGHTING



atlas A-PLAN LIGHTING

These new Atlas lighting fittings provide a means of easily integrating fluorescent and tungsten lighting in the creation of modern, sophisticated interior design. Dramatically simple in styling, each fitting is a complete lighting unit which can be used to add emphasis, achieve atmosphere or set attractive new lighting effects in the home, exhibition or display. By combining various Atlas A-Plan fittings with such contemporary tungsten fittings as the Atlas 'Chelsea' and 'Finlandia' ranges, infinite scope is provided for the creation of superb lighting schemes, incorporating both general effect and focal-point illumination.

ATLAS A-PLAN fittings are available in six styles, a variety of colours, and sizes of 2 ft., 4 ft. or 5 ft.

Full details from: ATLAS LIGHTING LIMITED, Thorn House, Upper St. Martin's Lane, London, WC2.

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 2 FEBRUARY, 1961

Editor and Managing Director:
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Joint Editor:
K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

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Comment

TARIFFS ON THE INCREASE

Now is the winter of tariff increases. Two electricity boards have just announced higher prices, three others are expected to do so any day now, and two others raised tariffs before Christmas. Nor is the tale likely to end there. The round of increases has been triggered off by rises in wages, coal and the stepping up of the bulk tariff. Together these sound sufficient reason for higher prices, but the 10% increases that several boards are favouring may need more justification, particularly as most boards showed higher surpluses last year and present unit sales are making nonsense of the 7% load growth concept. From April next CEGB prices will be up by about 3%, on top of which higher coal costs of over 6% will have to be met, in addition to each board's own cost increases. The situation is one which will demand the best of public relations in putting over the story to consumers. The real bogy is still the 48% ratio of self-financing to which the industry is committed. The failure to reach this figure in past years has necessitated the striving for well over 50% self-financing to achieve the average of 48%. In addition the coming years will make heavier demands on capital because of larger plant programmes. It begins to look as if the 48% figure is more of a millstone than a target, and the economy of the industry is being strained in consequence. It is this that needs making plain to consumers in the practical context of price increases.

INQUIRY MARATHON

A request for ministerial consent for building a power station at Holme Pierrepont went to the Minister of Power on 31 March last. The public inquiry finished last week after a span of two months, which included 14 days' hearing evidence, a period indicative of the mass of detail and argument advanced. Now the supply industry must await the Minister's consideration of the report of inspectors conducting the inquiry, which may involve his taking further opinion, and will certainly lead to more delay. Holme Pierrepont is admittedly the largest power station in Europe, but a timetable like this shows that planning delays are becoming out of proportion to other factors. To build a modern power station takes three to four years, from entering on the site to commissioning the first set. Engineering planning from provisional selection of site and set size to getting the station operational may be about six years. There is a real danger, therefore, that the administrative business of obtaining planning permission will determine how up to date—and hence how efficient and economic—a station can be. Much has been

heard about the interests of those concerned with country, and in the case of Nottingham and the nearby Holme Pierrepont, town amenities; but there are larger numbers with an interest in the price of electricity, on which power station construction and siting taken together exercise a first order effect. The Holme Pierrepont inquiry has been fought hard, with the objectors swinging from an initial attack on cost estimates to a final onslaught on atmospheric pollution worries. The right to an independent check of CEGB calculations, for which the objectors pushed hard, seems to have been left unexercised, and 650 ft high chimneys, 50 ft above the maximum the Air Ministry wished to impose, show how seriously the pollution problem is being tackled by the Authority and the Alkali Inspectorate. But for the future some way needs to be found of cutting down the time needed to get consent. The cost, though hidden, is real and high.

RAIL ELECTRIFICATION BREATHES AGAIN

The London-Midland main line electrification scheme is to be completed. This announcement on Monday by the Minister of Transport that this was so, endorsed the opinion of all who had looked at the present position in detail. The decision was taken from the rigid standpoint of whether electrification could pay; a new estimate from the British Transport Commission, details of which are still to come, apparently shows that this criterion is satisfied. And if the agreement to proceed with the scheme is right from this aspect, it is equally so from the important aspect of exports. Had the Government shown sustained doubt as to the claims of electrification for a heavily loaded trunk line, there would have been little effective sales talk left for the electrical manufacturing industry to use. In fact, Mr Marples covered this point in an aside near the end of his House of Commons speech. The decision, he indicated, was a sign that the Government was persuaded of the soundness of the British 50 c/s, 25 kV rail electrification system, and of the ability of British manufacturers to provide the equipment that could make it work. However, it did not follow that all electrification schemes that had been put forward would be approved. This suggests that such schemes will be examined in the light of the new financial arrangements being made for the railways, and of growing experience with the present trunk and branch line installations. There is still much to fight for in rail electrification, but the chance for success has been won. Necessary now is a good run through to the 1966 opening of the electric main line from Euston.

MARGINAL RESEARCHES

The National Research Development Corporation has some notable successes to its credit, arising from help it gave to private individuals in the early days of its existence. The annual report published last week, however, shows that the accent of activity today lies in another field. Despite a record total of over 500 suggestions for development received from firms and individual inventors, the Corporation could find only two worthy of financial support. In general, the procedure is that every suggestion is examined in some detail, so not all the 500 ideas suffered cavalier rejection; many benefited from advice offered by the Corporation, or from introductions arranged for the inventor to potentially interested firms, without the Corporation becoming financially involved. But on such figures, the previous impression is confirmed that there is no substantial reservoir of British inventiveness untapped because of lack of development capital. There is evidence, however, that the Corporation is adding to its laurels through encouraging the faster transition of the ideas of university staff into commercial reality. Apart from its routine task of exploiting Government department patents, the NRDC is shown to be covering marginal development, finding money to carry forward the ideas that seem improbable at first glance but which stand up to detailed consideration. In that way, brushless, variable-speed motors, flat television tubes and some sidelines of thermionic generation have joined fuel cells and printed circuits on the list. All show some hope of success, most promise early achievement.

DIRECT GENERATION

Thermoelectric equipment provides the most familiar example of the drive to convert heat directly to electricity without intervention of a thermodynamic cycle. The thermopile has been familiar to electrical engineers since school physics days; its companions in the four-pronged drive to direct generation are less readily in mind. They are thermionic generation, the fuel cell, and the lengthy-titled magnetohydrodynamics. What has happened to change the picture in the thermoelectric field is development of semiconductor materials which can greatly increase the voltage generated for a given temperature difference, and at the same time keep power losses within the generation equipment down to acceptable levels. It is too early to speak of practical thermoelectric generation for everyday applications. Natural home of the technique at present is the spaceship and the special military installation. However, encouraging progress is being made with devices of wider significance. Efficiency is climbing, with an early possibility of systems offering overall values better than 10%, and there is intense activity in the search for materials which can withstand the high temperatures which can help improve these figures. A time scale has little meaning in such a situation, and the effects of military security will in any case prevent much being heard until major achievements can be claimed. There is a real chance, however, that thermionic generation may be a useful method for a number of special purpose power applications by the end of the current decade.

Meteor

This week's quick summary of electrical news faces advertisement page 20

Thermoelectric generation

BASIC PRINCIPLES AND PRACTICAL DEVELOPMENT

by J. W. Gardner,* B.Sc., Ph.D., M.I.Nuc.E.

MOST conventional methods of power generation operate broadly along lines that may be expressed as follows, in over-simplified terms. Fuel is burnt and the combustion produces gas or vapour at high pressure which pushes on a metal surface, producing rotary motion which is then used to run a rotary dynamo. This sequence applies in its entirety to the steam cycle, the gas turbine and the internal combustion engine: its last stages also apply to hydro-electric generation and to proposals for using the power of tides and winds to generate electricity.

The potential advantages of eliminating this sequence and producing electricity directly from some form of primary energy (chemical, thermal, nuclear fission, etc.) are great indeed, and have long constituted a fascinating challenge to man's scientific ingenuity and imagination. Reduced capital cost, improved reliability and higher efficiency should all result from the replacement of a long and complicated chain of components by a single unit without moving parts. Thus there is a powerful economic incentive for the development of direct conversion generators for commercial and industrial applications. For certain military applications, and as power units for space vehicles, they are virtually indispensable.

Much of the recent interest in and support for work on direct conversion devices undoubtedly stems from military requirements where cost is no object and robustness and compactness are at a great premium. Nevertheless, it is quite evident from the current literature[1-6] that industry, particularly in the USA, is now taking an active interest in the development of units capable of the economic generation of electrical power on a commercial scale. There are four basic concepts which, on present evidence, appear to offer a promising development potential as ultimate large-scale direct-conversion generators. These are: MHD conversion (separating positive and negative charges in a gas), thermoelectric conversion (principle of the thermocouple), thermionic conversion (principle of the radio diode), and fuel cells (separation of positive and negative charges during a chemical reaction).

The first of these proposals has already been described in the ELECTRICAL TIMES[7], and it is the purpose of the present article to discuss the second. A short statement of the basic physical facts about thermoelectric phenomena is followed by an account of some of the newer materials which have made possible working generators on a laboratory scale, and in conclusion, an outline is given of some of the major technological difficulties besetting the exploitation of thermoelectric generation on an industrial scale.

It should be emphasised that the above four proposals, although the most promising of many, all still require a great deal of technological development before they become competitive large-scale power producers. Opinions may differ as to which of them will first "breakthrough" into this field, but there seems to be general agreement that the time-scale for this will be more rather than less than a decade. (However, it may be relevant here to recall the definition of an engineer as one who overestimates what he will accomplish in one year but wildly underestimates what he will accomplish in the next decade!)

* Dr Gardner is with the Atomic Power Division, English Electric Co., Whetstone, Leicester.

Fundamentals of Thermoelectricity

In metals and other good conductors, electric current is carried by free electrons, unattached to atoms. There are about 10^{23} such electrons in a cubic inch of a good metallic conductor, and even when no macroscopic current

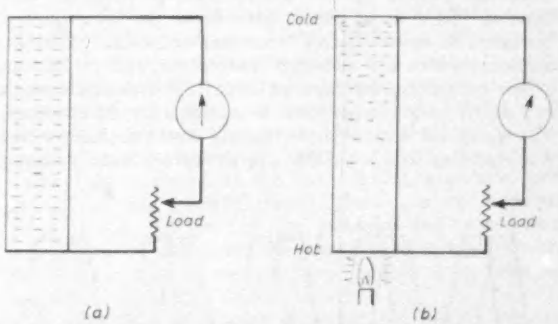

Fig. 1. Under the effect of heat, free electrons in a conductor migrate to the cooler parts and a voltage is generated

is flowing they have violent random motions which increase with temperature. If one end of a metal bar is heated the random motions of the electrons at that end will increase, with the result that there will be a net migration of electrons away from the hot end and towards the cold end. (See Figs. 1(a) and 1(b).) Such a systematic electronic drift, of course, constitutes an electric current, which may be legitimately described as being driven through the metal by the heat applied at one end. Here, then, is a direct conversion device: heat one end of a metal bar and an electric current flows! It sounds all too easy, and it is, as we shall see by considering what happens if we try to draw off the thermoelectric current to do useful external work.

Let us consider the simplest possible external circuit, consisting of a loop of wire joining the hot end of the bar to the cold end. (The wire could represent, e.g., a motor winding, but that need not concern us here.) Now this wire, being a good conductor by definition, will also contain free electrons in about the same concentration as the bar itself. Moreover, since the ends of the wire are in thermal contact with the ends of the bar, the resulting thermal gradient in the wire produces a thermoelectric current which opposes the current we are trying to draw from the bar. Actually, if bar and wire are not made of the same metal the electronic concentration will not be

quite the same in each, and a small net current will flow around the circuit. This is the well-known effect discovered by the Berlin experimenter, Thomas Johann Seebeck, in 1821 and named after him. (Seebeck, who died in 1831, could not, of course, have realised the true nature of his discovery since the atomic structure of matter and the existence and nature of the electron were not elucidated until the late nineteenth century.)

Evidently, the Seebeck effect in metals is not a very efficient way of converting heat to electricity, for the flow of any current at all is dependent on the slight difference in free electron concentration existing between the two metals. Nevertheless, by suitable choice of dissimilar metals and the use of many thermocouples in series (thermopile), efficiencies by 1850 had been raised to 3%, which was higher than the efficiencies of the steam engines of those days. For almost a century after that, although thermocouples were widely used for measuring temperatures, their efficiency as generators could not be improved and it seemed that the limit had been reached.

Semiconductors

This situation has changed significantly in the past decade or so with the discovery and development of "semiconductors," having properties intermediate between conductors and insulators. In a perfect insulator, each atom has exactly its full complement of electrons with none to spare; in a metal there is, as we have seen, a considerable excess of free electrons, viz., about 10^{23}/cu in. Semiconductors are classified into n-type and p-type: an n-type semiconductor contains about 10^{20} free electrons/cu in., whilst in a p-type there is a deficiency of electrons. The vacancies due to these missing electrons behave like free electrons with a positive charge and are usually known as "positive holes." A p-type semiconductor contains about 10^{20} such positive holes per cu in.‡

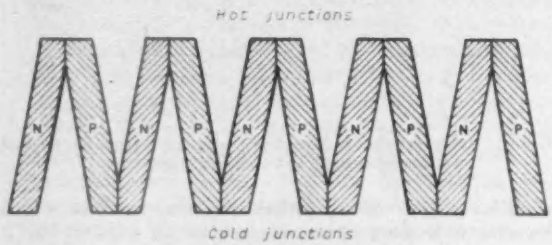

Fig. 2. In a thermocouple having alternate components of n-type and p-type semiconductor, electric currents in one type of component reinforce the other

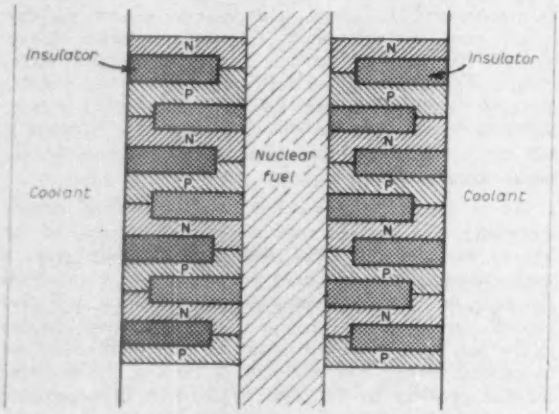

Fig. 3. Possible use of semiconductors for direct generation of electricity in a nuclear reactor, giving good thermal efficiency

Now we have seen in the above discussion of a thermocouple made of two dissimilar metals, that the net current generated is the difference between opposing currents flowing in the two branches. It is easy to see, on the other hand, that in a thermocouple having one branch of n-type and the other branch of p-type semiconductor the thermoelectric currents in the two branches will reinforce. (See Fig. 2.)

Another advantage of replacing metals by semiconductors in thermocouples stems from the fact that metals are excellent conductors of heat, as well as electricity. This makes it extremely difficult to maintain a large temperature difference between hot and cold junctions and consequently imposes a severe limitation on the thermoelectric e.m.f., which is directly proportional to the temperature difference. Ideally, what is required is something which is both a perfect electrical conductor and a perfect thermal insulator; no such ideal material exists but semiconductors, on the whole, come much closer to it than do metals.

Materials for Higher Temperatures

The design of a practical thermoelectric generator is complicated by the fact that semiconductor properties change with temperature so that for any given material the best compromise of properties will exist for only a small temperature range. On the other hand, as we have seen, a large temperature difference between hot and cold junctions is required to obtain a useful output voltage. The difficulty could, in principle, be met by constructing a thermopile in which the stages are made of different materials, each efficient in its small temperature region. For temperatures up to about 1,000°F, suitable materials are already available. However, hot-junction temperatures above 2,000°F would probably be needed to obtain a worthwhile efficiency in any large-scale thermoelectric power generator.

At these higher temperatures, semiconductors are no longer suitable since they become "intrinsic;" that is, the input heat causes positive and negative charges to migrate in equal numbers and so no output voltage is obtained. A possible way out of this difficulty is to use insulators which have been suitably "doped" to become good thermoelectric materials and which do not become intrinsic until temperatures well above 2,000°F. For example, pure nickel oxide is normally an insulator, but if it is modified by the addition of 3% of lithium its resistivity decreases to about 0·01 ohm-cm. The explanation of this behaviour appears to be as follows: in normal nickel oxide the nickel has a valence of plus two but the addition of lithium causes the appearance of nickel with valence plus one; the exchange of charges between plus-one nickel and plus-two nickel accounts for the vastly increased conductivity. Similar modifications to other insulating materials are currently under active investigation, for example, in the Pittsburgh Laboratories of the Westinghouse Corporation.[10]

Further problems are encountered in the fabrication of these new materials into thermocouples and their subsequent assembly into complete thermopiles. Obviously, this must be done in such a way as to minimise the contact resistances between the different materials employed, for high contact resistance would have the same effect as a high internal resistivity of the material, reducing the

‡ This picture of semiconductors, although correct in essentials, is over-simplified. For a fuller account the interested reader is referred to such monographs as references 8 and 9.

efficiency. Also, at temperatures above 500°F to 600°F it is necessary for thermopiles to be shielded from the air to prevent corrosion and deterioration of the joints.

Nuclear Applications

What has been said up to now applies equally whether the heat source for a thermoelectric generator is a conventional furnace or a nuclear reactor. In the latter case, however, the risk of damage by nuclear radiations is added to the hazards of high temperatures and chemical attack. Very little is known about the behaviour of thermoelectric materials under conditions of prolonged and intensive nuclear irradiation such as they would be exposed to in a large power reactor.§ Nevertheless, if suitable materials can be found it seems certain that much greater efficiencies in thermoelectric applications will be possible with nuclear rather than conventional heat sources. This is primarily because in a reactor it will be possible to have the heat source, i.e., the nuclear fuel element, completely surrounded by thermoelectric elements and so eliminate stack losses. (See Fig. 3.) There are, in fact, possible nuclear fuel materials such as uranium and thorium sulphide which are themselves semiconductors, but it is not yet known what the long-term thermoelectric behaviour of these would be in a nuclear reactor.

Evidently, there is a considerable economic incentive to investigate the properties of thermoelectric materials under prolonged nuclear irradiation. However, if commercial and/or military security precludes early publication of the results, it may not be possible for some time to assess either the quantity or the degree of success of this work.

The idea of using a nuclear reactor as the heat source in a thermoelectric generator is also attractive for the following reason. It has already been indicated that in any practical generator a large number of stages in series will be required, since a single thermocouple delivers only fractional voltage; for example, for bismuth telluride—a typical material in this connection—the output is around 10 millivolts for a temperature difference of 100°F between hot and cold junctions. Thus, the fact that a typical nuclear power reactor contains many thousands of fuel elements could be exploited if thermocouples incorporated in these fuel elements were connected in series to produce reasonably high output voltages. This idea has been developed in more detail elsewhere.[5,11]

Present Status and Outlook

As an indication of the present "state of the art" of thermoelectric generation may be cited the fact that laboratory models in the 1 W to 10 kW output range are already being built.[5] These models use indirect (conventional) heating. Although the intrinsic efficiency of conversion of heat to electricity depends only on the thermoelectric properties of the materials used, and is independent of the size of the generator, nevertheless, design studies indicate that stack losses and other practical disadvantages will reduce the overall efficiency of indirect type generators above the 10 kW size. For larger outputs it appears, therefore, that the direct type, where the thermoelectric elements surround or are incorporated in the nuclear fuel, will be superior; but the development of these depends, as we have seen, on finding materials which retain their thermoelectric properties under prolonged nuclear irradiation. The first industrial thermoelectric generators will probably be small "toppers" utilising the waste heat from conventional generating systems; or, if they are used in conjunction with nuclear reactors, they will be placed in the cooling loop to protect them from radiation damage.

With present-day materials, the intrinsic efficiency of thermoelectric generation is about 17%, which, however, becomes an overall efficiency of only about 6% if the heat source is a conventional fuel burner.[10] It has been conjectured[5] that in about five years new materials will have an intrinsic efficiency of about 30%. If present trends continue, small domestic thermoelectric generators may become economically feasible within the next decade. Many applications spring to mind for such a unit in which the absence of moving parts would confer the advantages of silent and virtually maintenance-free running. A thermoelectric-powered lawnmower ought to give satisfaction to the Noise Abatement Society and perhaps would restore a little peace and quiet to the suburban Sunday!

In conclusion, it is worth reiterating that the thermoelectric generator, in common with the other direct conversion devices mentioned above, is inherently a low-voltage, high-current, d.c. source. Evidently, inversion and transforming to multiphase a.c. will be a necessary operation if thermoelectric generation is to be adopted in central power stations. This is, of course, a whole subject in its own right; suffice it to say here that development of compatible static inverters is under way and the inverter technology is ahead of the basic power generator technology at the present time.[12] There are no apparent fundamental barriers to the efficient and economical conversion of any level of power contemplated in the foreseeable future, the problem being rather one of practical engineering development.

The author is indebted to the English Electric Company for permission to publish this article.

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§ Westinghouse laboratories report little change in the thermoelectric properties of the lithium-treated nickel oxide after exposure to total integrated thermal neutron flux of 1·4 by 10^{19}. This, however, is equivalent to only about four days' exposure in one of the reactors of the Hinkley Point nuclear power station, whereas a useful life of the order of years would presumably be a prerequisite for any worthwhile thermoelectric generator.

Cables for Light Fittings. In connection with the recent articles and correspondence on heat and lighting fittings, readers may be interested to note that a booklet, "Effect of Heat from Modern Electric Lamps and Fittings on Cable Insulations," is available free from the Cable Makers' Association, 52 High Holborn, London W.C.1. The booklet discusses temperature limits for various insulations and makes recommendations for dealing with new and existing installations.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Space Heating in America

IN your 22 December issue, Mr J. P. Thornton of Victoria, BC, Canada, writes, "Resistance heating for homes is quite rare in North America."

According to *Electrical World*, 19 September, 1960, p.110: "The number of all-electrically-heated homes (in the US) is increasing at an average rate of about 21% a year, and should hit 760·2 thousand units by the end of 1960." This information was from an *Electrical World* survey achieving returns from 164 utilities (which represent 78·6% of US residential customers and 83·6% of US generating capability). Other data indicate that about 9·9% of these homes have heat pumps and about 90·1% resistance heating.

In 1959, the number of new electrically heated homes placed in service equalled over 6% of reported housing starts for the year; in 1960, this swelled to about 10%. We submit that this, while yet small, hardly deserves the description "quite rare."

US utilities, in general, today accept this load and an increasing number promote it with specially designed rates. Estimates for the number of totally-electrically-heated homes in service in 1970 range from four million *(Electrical World)* to six million (National Electrical Manufacturers Association).

C. F. Hochgesang,
EDITOR, *Electrical World,*
NEW YORK, NY, USA.

New Name for 13 A Plugs

SURELY the answer to the fuse difficulty in 13 A plugs is to rename them, say, "multi-amp plug." That would remove the implication that it would largely be associated with a 13 A fuse, and require a purchaser to state the fuse rating needed.

K. Shindler, GRADUATE I.E.E.,
BARNET,
HERTS.

Apprentice Electricians Studies

I READ with interest your article on the new apprenticeship scheme for the contracting industry (ELECTRICAL TIMES, 12 January), hoping that a more enlightened policy had been adopted. I was disappointed.

One change, that of requiring satisfactory completion of each year's work, is useful, but it is short sighted to make this unconditional. A reasonable effort on the part of the student should count for something, surely.

Two other points arise with regard to the education of the apprentice.

The probationer (age 15-16) is required to attend preliminary classes in the evenings. This will mean three evenings a week of at least two hours, in some cases for a whole year, and in others for about two months. Was any educational authority consulted on this? Apart from the discrepancy in the probable benefit resulting from these courses, has any thought been given to the general welfare of these young people?

The course leading to a City and Guilds "B" certificate is of three years' duration; part-time day release is obligatory on the employer for only two years. To add to this anomaly, having somehow obtained a "B" certificate the apprentice is to be allowed to continue his studies.

Is it expected that this agreement will be taken as a serious attempt to improve the standard of qualifications of those engaged in electrical contracting? I would suggest that it cannot, even if the contents of the recent White Paper are ignored. Can we afford to ignore them?

L. A. W. Savage,
LONDON, S.E.22.

Conductors for Spur Boxes

AS a regular reader I have always been very interested in the interpretations of the Rules and Regulations which you have published from time to time. I would be grateful if you could support me in questioning what I consider a very uneconomical practice.

In the case of installing a 750 W infra-red heater, or any small appliance, I have always interpreted that the spur of the circuit is that cable up to the point of fusing in the spur box. From here I reduce to an economically sized cable, namely 3/·029 protected by a 5 A fuse.

This is what I consider a common-sense practice, and what the IEE had in mind when compiling the regulations. This is frowned upon by the installation inspectors in this area, as when interpreting 114B (ii) they consider the spur includes the wiring to the appliance.

Installation Engineer,
NORTHANTS.

[No. 23 in the series of official interpretations of the IEE Wiring Regulations, published in December, 1956, appears to cover this point. It says "it is admissible to terminate a spur of 7/·029 in. cable in a spur box from which a cable having smaller conductors may be run to the clock connector, provided it is protected in accordance with Reg. 108 by the fuse in the spur box." Query No. 23 related mainly to clock connectors.—ED.]

Open-cast Coal Dispute

I WOULD like the opportunity of correcting a statement which appeared in your issue of 8 December under the heading of "Open-cast Coal Dispute" in the Overseas News section.

The figures in the second sentence should be an average of 25,000 tons of coal a fortnight at approximately 56s 6d per ton. The tonnage referred to later in the paragraph as being offered to other collieries should read 31,000 tons.

The final sentence is incorrect. This Commission is one of the principal consumers of coal but did not suggest that coal should continue to be supplied on the basis of the old contract.

J. B. Jukes,
GENERAL MANAGER,
STATE ELECTRICITY COMMISSION OF WESTERN AUSTRALIA.

Theme in lighting design

PHILOSOPHY UNDERLYING THE "A" PLAN

by P. T. Rodd,* L.I.S.A.

IT has often been said that fluorescent lighting has little place in the home; the light is too glaring, the tubes too long and the fittings too expensive. It is a philosophy which I have never been able to accept; nor, fortunately, has the company with which I happen to be associated. True, a fluorescent lighting fitting is more expensive than the cheapest of tungsten filament fittings and takes up more room (though some tungsten filament fittings of attractive design are even dearer than fluorescent) but these are challenges to the lighting designer rather than drawbacks and, in the long run, the fluorescent tube more than holds its own on the score of efficiency, long life and low running cost.

That is not to say that fluorescent lighting will in time replace tungsten filament lighting entirely in the home—or elsewhere for that matter—for the two forms are complementary. Fluorescent lighting, properly applied, will provide the comfortable, glare-free overall lighting for good living and seeing, while tungsten filament lighting provides the sparkle and local high-level illumination for close work or reading. Whether the room be contemporary in design or period, both forms can be skilfully combined to achieve the best or most acceptable effect. That is the sphere of the lighting engineer.

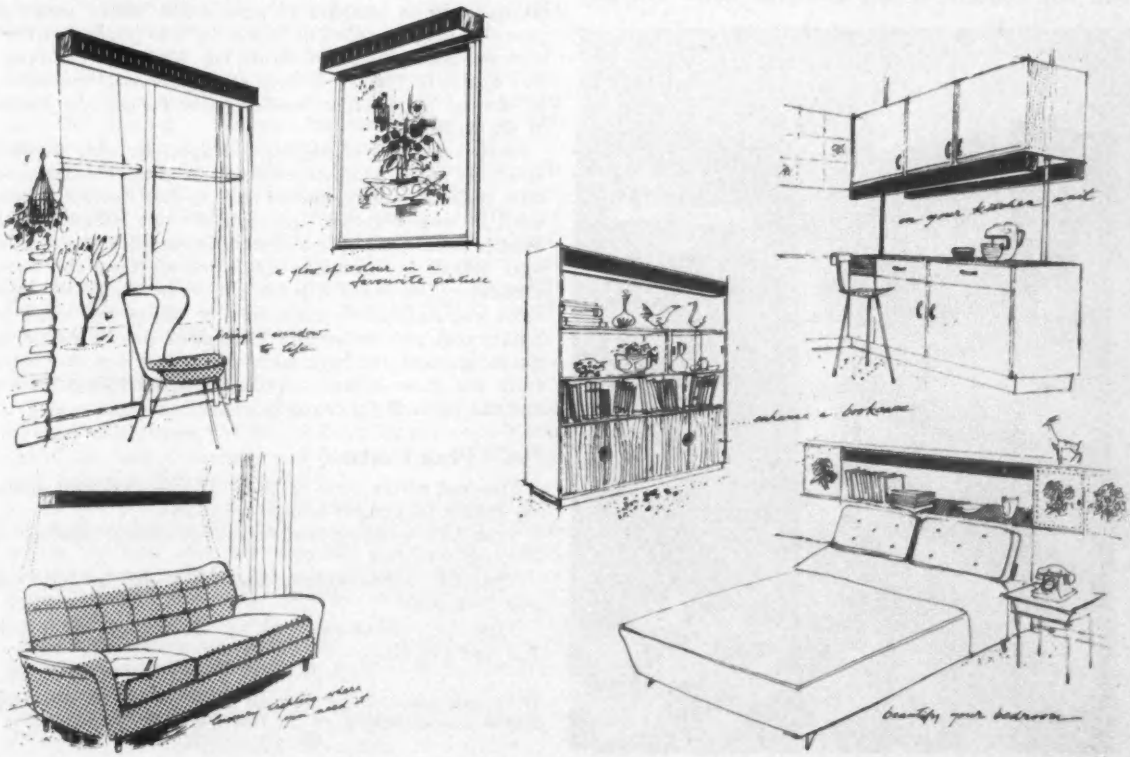
* Fittings Designer, Atlas Lighting Ltd.

But lighting alone is only for part of the day. For the rest of the time the lighting fitting serves no other purpose than to add to, or detract from, the general décor of the room. In the degree to which it does either will depend much of its appeal—or lack of appeal—with the home-lover. This is the field of the fittings designer. It is a field in which the vital factor is not so much his own personal taste as his estimate of the popular judgment. There is also the matter of current design trends in fashion. Are they contemporary? Period? Nondescript? It is not easy to say; far less to predict. And when a new medium is introduced, as was the case with fluorescent lighting ten to 15 years ago, there is no experience of public reaction to go on. The fittings designer is on his own. He has to experiment and trust that, sometimes, he will be lucky.

Early Experiments

Today he is in a different position. There is a wide and expanding acceptance of fluorescent lighting in the home. Early prejudices have given place to critical acceptance and, sometimes, wholehearted approval, as shown by exceptional demands for a particular design. This has been due to those early efforts of a few who did not accept the general feeling.

One of the earliest designs was a cornice lighting unit



which could be plugged into the nearest socket and supported on the picture rail on a "do-it-yourself" basis. Here, the designer's approach was to make the fitting inconspicuous against the wall during the daylight hours. Other important innovations were the introduction, in 1948, of the 2 ft 40 W tube for domestic use—an endeavour to meet the length objection and now widely used in other fields as well—and, a year later, the first "soft" fluorescent phosphor in the "peach" tube.

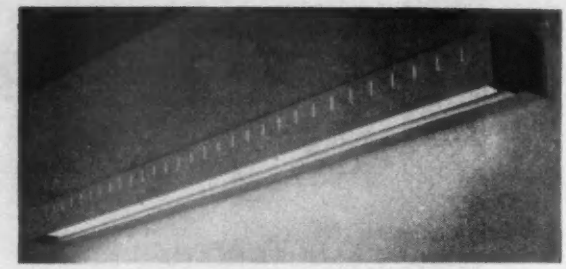
Designers continued to try and interest the home-lover in fluorescent lighting with such fittings as the "pin-up" fitting for mirror lighting, bedheads, picture illumination and similar situations, ceiling units and others, while engineers, in an endeavour to reduce the costs of control gear without sacrificing efficiency or reliability, conceived the first of the "family" series of batten fittings, the low-priced "Popular Packs" which reached a further stage of development with the introduction of the new slim ballasts, in autumn 1959, in the "super-slim" series which, in the short space of 15 months, has exceeded the million mark in production.

In 1955, the now famous "Kitchenlight" to the design of John and Sylvia Reid was launched. Contemporary in concept and execution, critics predicted failure, but were confounded by the overnight demands from enthusiastic home-lovers everywhere. Today, with close on a million sold, it remains in great demand.

Lessons of Experience

The lessons from this decade of home-lighting experience confirms that fluorescent lighting is readily acceptable in the modern home but that the average home-lover prefers the type of fitting which he can install himself and experiment with if he desires. Much has been said about "educating the public" in lighting matters. In actual fact, the average man or woman strongly resists forceful education, at least on home matters. They prefer to form their own opinions, develop their own tastes. You may suggest, guide and help them in their problems but, in the long run, it is their decisions that matter. They are the final arbiters of design. They are the arbiters of cost as well. Meet their views and purses and you have a profitable market—and there are some ten million homes, at a conservative estimate, in which fluorescent lighting may yet be installed.

In the contemporary living room, LD units from the "A" plan range provide interest lighting on the bookshelf as well as highlighting a favourite painting



From the "A" plan range, the 5 ft LD unit

It is against this background of experience that the new Atlas "A" plan of lighting for the home is being launched. The plan is based on the idea that, for the most satisfying results, it is necessary to tailor the lighting of a room to the needs of those using it and to the character of the décor as well. When an interior receives individual lighting treatment based on standard fittings, the results often appear to look as though the lighting was added as an afterthought. To meet this in the "A" plan, we tackled the problem by first setting out to provide a series of fluorescent lighting units, based on the popular "super-slim" series of battens, which were simple in shape and character, harmoniously related and unobtrusive. They were to be available in a number of forms and sizes, in a range of colours and capable of being used in a variety of ways to give a "built-in" or "intended" look. They were to be low in cost, reliable and well constructed and suitable for installation by the home handyman. The fittings were to establish a basic mood within which a choice of tungsten filament fittings were to provide variety, contrast and sparkle. In short, the whole of the range was to enable the home-lover to achieve an atmosphere, by day or by night, in keeping with the general theme of the room.

From a number of suggested designs, six were selected as a basis of the fluorescent side of the plan. This included three indirect or semi-indirect units to give upward, downward or dual-direction lighting and three diffuser units. Models were made up and tested. During this phase, slots were added to relieve the dead contrast from the outer surfaces of the units when alight. From these, the final form was established and structural refinements made to reduce cost and to simplify installation. In the course of the programme, the basic super-slim batten was eliminated from the three indirect units as a further simplification but was retained for the diffuser units.

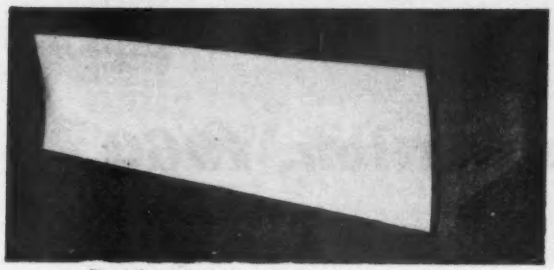
"A" Plan Units

The first of the units in the "A" plan, released today, are the six fluorescent fittings as follows:

Type LD, wall-mounted for uni-directional lighting, in 4 ft and 5 ft sizes.

Type LE, wall-mounted, dual-directional, in 2 ft, 4 ft and 5 ft sizes.

Type LF, ceiling-mounted for downward lighting, in 4 ft and 5 ft sizes.



The 2 ft HDK/LA12 incorporates a fabric diffuser

Type HDK/KN, wall-mounted with shielded plastics diffuser, in 2 ft and 4 ft sizes.

Type HDK/KW, ceiling-mounted with clip-on diffuser, in 2 ft, 4 ft and 5 ft sizes.

Type HDK/LA12, wall-mounting with patterned fabric diffuser, in 2 ft only.

Each unit is of the switchstart circuit type with choke ballast and is supplied with an Atlas "de luxe warm white" tube, which is held in position with spring clips. It is particularly easy to install and a choice of colours—black, white, tangerine or mushroom—is provided.

Although the basic position of the fittings is as stated above, they can also be installed in any position which might suit the user as part of the architectural plan without danger from overheating. As with all fluorescent lighting fittings, the temperature is only a few degrees above atmosphere, no matter how long it is alight.

Lighting Effects

Lighting effects can be grouped into four main classes, background, light for seeing, highlighting and interest lighting.

Background lighting provides a soft, general background effect by indirect light falling on walls, curtains, etc., from concealed fittings or from fittings incorporated into bookcases, room-dividing features, etc.

Light for seeing is high-level lighting needed in many household positions, such as over a kitchen table, dressing table or other working area or over a settee or writing table for reading or writing. Another position is on the bed-head for use at night or when confined by illness.

Highlighting is the accentuation of special features, such as pictures, sculpture, a clockface, plant trough or flower arrangement by spotlight or local indirect lighting of higher intensity than the predominant background lighting.

Interest lighting is the breaking up of large plane areas by shadow contrasts, colour beams, sparkle from spotlights on reflecting surfaces and similar devices to relieve any sense of lighting monotony.

Use of the Fittings

Effects in the first category can be achieved by using one or more of the three "A" plan indirect lighting units. These are of the same rectangular end treatment but each has its own way of distributing the light.

The above fittings can also be used in combination with the three remaining units to provide light for working and seeing, the local units providing the higher level lighting and the indirect units the background lighting which defeats eyestrain where too much contrast in lighting levels is prevalent.

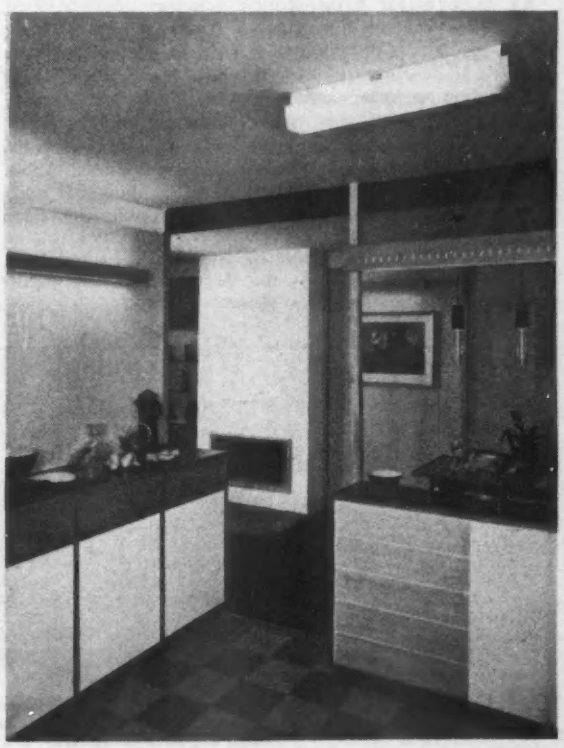
For highlighting, any one of the six units can be used on large areas with the addition of low-voltage spotlights to give greater contrast and sparkle; in the smaller areas, the spotlights, by themselves, may meet the case. Though highlighting by special fittings is sometimes looked on as a luxury, it is undoubtedly the best way to provide the dramatic effects so essential to the display of pictures, horticultural features and other focal points of the room.

Tungsten Fittings for the "A" Plan

The "A" plan is specifically designed to include the well-known Atlas "Chelsea" range of handwrought glass, end-illuminated from slim black metal cylinders in such a way that the full beauty of the glass is brought out dramatically. The glass shapes are in a variety of forms and colours. A companion range, "Finlandia," makes use of several concentric glass cylinders in differing lengths, diameters and colours which are interchangeable to provide an almost endless combination of colour and effect. Then there is the now well-established Forrest Modern range of coloured metal fittings in contemporary forms and colours and, of course, there is an almost limitless range of lighting fittings in period or classic style.

The provision of a number of lighting fittings which are loosely inter-related is, however, only part of the scheme. The ultimate effect is achieved by the harmonious grouping of selected units in relation to their surroundings according to the ideas and taste of the individual home-lover.

Much has been said about the functions of the experienced lighting engineer and domestic lighting consultant but, in the home, the home-lover is just as likely to achieve the desired effect if they have at hand a choice of fittings, both fluorescent and tungsten filament, with which they can experiment and which are not beyond the limits of their purse or technical abilities to install. It is the object of the "A" plan to make that provision. If the initial designs are as acceptable as I hope they will be, there is no reason why the range should not be extended. But the home-lover will be the ultimate judge of the designs.



The kitchen area uses a 2 ft HDK/KW ceiling unit with an LE wall mounted unit over the working plane. In the alcove, two "Chelsea" fittings provide table lighting

Canadian generation, 1960

QUEBEC'S NEW HYDRO PLANTS EXCEED 1 MILLION H.P.

CANADA'S hydro-electric generating capacity increased by 1,741,820 h.p. during 1960 according to a recent report.* Although this figure is less than 70% of last year's record figure, it still represents a massive increase in the country's total capacity, which is now listed as 26,372,444 h.p. Most of the new hydro-electric plant is in the Province of Quebec, where the increase in capacity by 1,176,500 h.p. was mainly the result of further commissioning at the Bersimis II and Beauharnois stations.

This year, commissioning is not planned to exceed 243,000 h.p., but schemes under construction will add a further 4,500,000 h.p. in later years. These schemes do not, of course, include the Peace and Columbia projects, which have not yet reached the design stage.

Once again there was a significant increase in thermal generating capacity to meet the rapidly increasing energy demand. Most of the hydro sites adjacent to loads have been exploited, particularly in Ontario, and it was in this province that the largest rise in thermal capacity occurred. Five other provinces increased their thermal generating capacity considerably, a trend which will aid the conservation of resources through the operation of an integrated system supplied by both thermal and hydro-electric plants.

Major Installations

All three major hydro-electric schemes commissioned during the year were in Quebec Province. The Quebec Hydro-Electric Commission has now completed the Bersimis II development with the last two of five 171,000 h.p. turbines operating under a head of 377 ft. The development includes two dams, one of concrete and the other rock-filled to provide the head and regulate river flow. Five more units were also added to the Beauharnois station. These units are rated 73,700 h.p. There are now nine units running and a further two units will complete this third stage of the development. Eventually, the three sections of the scheme will include 39 generators.

At the 840,000 h.p. Carillon project, heavy construction work is proceeding and excavations for the main dam and power-house are nearly completed. Concrete pouring will begin shortly. The project is expected to cause some river regulation problems and a preliminary survey for control dams at the Lake of Two Mountains has been completed.

In 1960, the first details of the 6,000,000 h.p. Manicouagan River scheme were announced. Development of three major waterfalls on the Manicouagan River will provide 3,700,000 h.p. The remainder of the power will be derived from two dams to be built on the Outardes River at distances of 45 miles and 58 miles from its confluence with the St. Lawrence. This project will also regulate the river flow, making possible a further increase in generating capacity at the McCormick dam, from the present capacity of 292,400 h.p. to nearly 580,000 h.p.

Two turbines, rated 200,000 h.p., were added to the Chute-des-Passes station of the Aluminium Co. of Canada early in the year and this station is now complete.

In British Columbia, the Mission dam was brought into service as the completion of the final phase of the Bridge River development. The remaining two 82,000 h.p. turbines were added to the No. 2 power-house to give a combined output capacity for the four plants forming the development of 692,500 h.p.

The Kelsey station in Manitoba was almost completed during the year. This station has five turbines operating under a 50 ft head and rated 42,000 h.p. The Manitoba Hydro-Electric Board also began work on the Grand Rapids development on the Saskatchewan River.

Ten generation projects are under consideration or have reached the planning stage in Ontario. They include five hydro-electric projects, notably the Red Rock Falls station, where the power-house construction is virtually complete, and five thermal stations. Two of these are the nuclear generating stations under construction at Des Joachims and Douglas Point.

* Bulletin 2720: "Progress in Electrical Generation in Canada—1960." Published by the Dept. of Northern Affairs and National Resources, Water Resources Branch.

	Hydro Plant		Thermal Plant		h.t. lines commissioned in 1960 Miles	Increased transformer capacity in 1960 MVA
	Commissioned in 1960 h.p.	Under const'n or planned h.p.	Commissioned in 1960 MW	Under const'n or planned MW		
B.C.	175,800	224,500	22·3	905	207	60
Alberta	102,000	200,000	88	150	248	201
Saskatchewan	3,300	586,000	66	—	307	83
Manitoba	168,000	492,000	66	66	214	144
Ontario	26,500	1,662,000	400	3,220	116	795
Quebec	1,176,500	6,776,000	36	—	296	98
New Brunswick	—	0·6	—	250	117	20
Nova Scotia	—	142,000	20	—	130	—
Newfoundland	13,100	710,500	5·5	4·2	104	—
Prince Edward Island	—	—	10	—	42	—
Yukon and N.W. Territory	9,200	—	4	—	—	—

Totals are based on bulletin* and do not necessarily include all new plant

Oil-filled cable for 400 kV

TYPE APPROVAL TESTS AT NEW HIGH VOLTAGE LABORATORY

TYPE approval tests for a single-core oil-filled cable for 400 kV working have provided a fitting initial project for a new h.v. laboratory at the Eastleigh works of Pirelli-General Cable Works Co. Ltd. The cable has been subjected to tests which included a series of impulses at voltages up to 1,600 kV peak.

General construction of the 400 kV cable is shown in Fig. 1. It is a single-core central-duct design, with an overall diameter of 4·1 in. Three such cables laid side by side in the ground with 6 in. between centres would have a continuous power transmission capacity of between 528 MVA and 678 MVA over the range of soil thermal resistivity normally met.

Conductor cross-section of the cable is 0·9 sq in., and the nominal maximum stress at working voltage is 160 kV/cm. The insulation thickness of 0·90 in. provides for an impulse voltage withstand level of 1,400 kV. Capacitance is 0·188 microfarad/1,000 yards, giving a charging current of 13·6 amp/1,000 yds.

As tested (Fig. 2), the cable was made up with an outdoor sealing end, straight-through joint, a stop joint and an oil-immersed sealing end (for transformer-tank termination). Groups of ten positive and ten negative impulses were applied at 50 kV intervals, with satisfactory performance up to 200 kV above the nominal withstand level. Power factor/voltage and similar tests were also carried out.

Laboratory Design

The new laboratory is designed to facilitate test and development work on cables of the highest voltages, but it has been largely equipped with plant already possessed by Pirelli-General. One of the main requirements for cable testing at the highest voltages is ample floor space. For example, experiments on a new design of 132 kV three-core joint require erection not only of the joint itself but also of its sealing ends and two splitter boxes, involving an area of at least 1,500 sq ft. Where a new design is being proved, as with the 400 kV cable, at least one example of each type of accessory is included, and the floor space requirements are correspondingly increased. Tests may continue for some months before approval of the design is obtained, so floor space becomes at a premium.

The second, more obvious requirement of a high-voltage laboratory is height. This is required in terms of clearance for the h.v. equipment, notably the impulse plant, which must be capable of generating peak voltages of about 2,000 kV.

The new Pirelli-General laboratory building offers a floor area of 13,500 sq ft and 60 ft clear height from floor to apex of roof in the main test bay. The building is divided into two bays, the larger 125 ft by 70 ft. This bay is of portal frame construction eliminating the intrusion of roof trusses. The smaller bay, 70 ft by 65 ft, has a pitched roof with a height of 32 ft to the eaves. Both bays are steel framed with aluminium sheeting and an insulating lining. Red quarry tiles are used for flooring to avoid the dust that inevitably arises when concrete is used.

All major items of test equipment are controlled from a control room between the two bays, 8 ft above the laboratory floor. This is provided with plate glass windows sloping outwards from the floor (Fig. 3), giving operators and test observers an almost uninterrupted view of the whole laboratory.

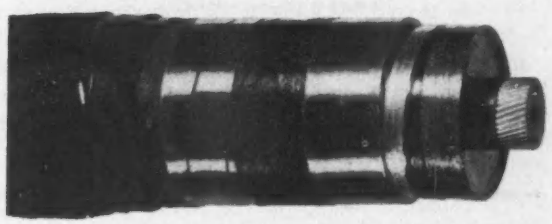


Fig. 1. Construction of 400 kV oil-filled cable. Overall diameter is 104·27 mm, 88·36 mm over the lead alloy sheath. Radial thickness of insulation is 23·7 mm. Details of construction are noted below, in order from the cable centre outwards

1. Oil duct
2. Steel spiral
3. Conductor
4. Conductor screen C.B. paper
5. Insulation W.P. paper
6. Insulation screen C.B. paper interlocked with perforated metallised paper
7. Lead alloy sheath
8. Impregnated cloth tape
9. 6-plain copper wires longitudinally applied
10. Impregnated cloth tape
11. 2-HD tin bronze tapes $\frac{1}{2}$ in. by 0·006 in. in parallel.
12. QR2QH2 serving overall

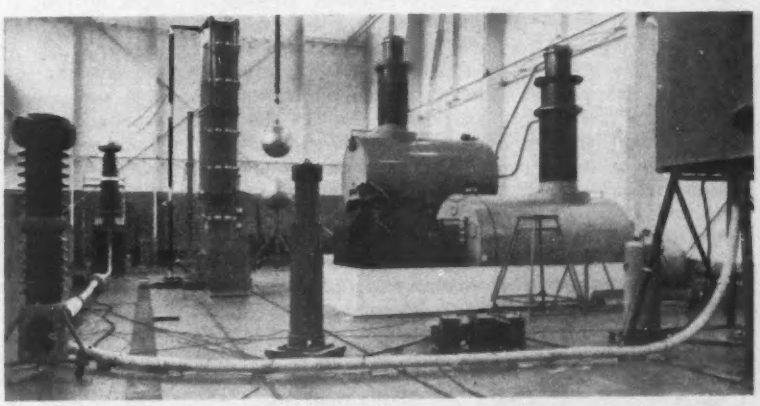


Fig. 2. General view of test installation for 400 kV cable system, including sealing ends, a straight-through joint and a stop joint. The heating current transformer is in the right foreground

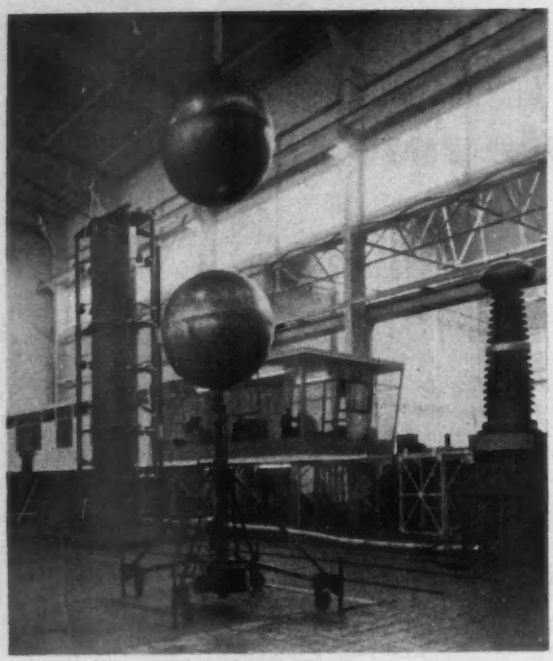


Fig. 3. A control room designed to give a clear view of the test area is a feature of the new laboratory

High windows provide natural illumination in the test bays, which can be supplemented by eight 400 W mercury-vapour lamps on the walls of the main bay just below window level, where replacement is less difficult than with roof mounting.

In the larger bay is a Micafil impulse generator, giving an open-circuit surge voltage of 2,400 kV, with 57 kW-sec surge energy. This generator is somewhat unusual in design in that its capacitors are contained in a central column of bakelised paper, giving noticeably compact construction. A 12-stage Marx circuit is employed, charged at 200 kV d.c. via a mechanical rectifier. This generator is carried on rails, permitting a choice of any of the four possible operating positions.

Fifty c/s voltages are obtainable from two 500 kVA, 333 kV Ferranti transformers, one of these being suitably insulated from earth so that the two may be operated in cascade to give 666 kV test voltage. In association with these transformers there is a standard capacitor of the compressed gas type of 100 pico-farads, 500 kV rating, which is used in conjunction with a Schering bridge for power factor tests. Voltage measurement is by a 1·5 metre sphere gap.

The smaller bay of the laboratory is equipped with a further 800 kV Ferranti impulse generator, giving 22·4 kW-sec output. There is also a 300 kVA, 150 kV Ferranti transformer for 50 c/s testing and a further 30 kV, 100 kVA transformer. This section of the laboratory has a 50 cm sphere gap and a 100 kV, 100 pico-farad standard capacitor.

Cable Heating

When it is necessary to heat the conductor of cable assemblies undergoing test, a link is provided between terminations and this is passed through current transformers, which can be used to induce current in the enclosed loop (Fig. 2). Two induction regulators provide a total heat output of 275 kVA through five separate output points to supply these heating transformers.

For measuring thermal characteristics of a cable, a 30 kW, 3,000 A d.c. motor-generator set is provided.

FINANCING DEVELOPMENT

NO less than 511 inventions and ideas for development reached the National Research Development Corporation in the year ended 30 June, 1960, from firms and individuals. This compares with 296 in the previous year, says the Corporation's annual report published last week. However, only two of these ideas were accepted as qualifying for development in the public interest. The report comments that a great deal of work has to be done in assessing inventions, and in some cases an inventor is helped by advice or the introduction to a manufacturer, notwithstanding that his invention does not qualify for financial sponsorship by the Corporation.

Most of the projects that receive support come from Government departments and universities. In the year under review there were 301 from Government departments and research council, 44 from Commonwealth official organisations, 20 from industrial research associations and 137 from universities. There were no applications from nationalised industries.

The Corporation spent £427,000 on development work during the year and it has entered into forward commitments for development purposes amounting to £739,000. Its income consists of sales of patent rights and other profits from exploitation of inventions.

The report summarises briefly work currently in hand. Projects of electrical interest include the following:

Automatic Process Plant Control. A new project, this is concerned with development of electronic automatic control equipment suitable for plant and process control automation, including power station control. It contemplates development of standard range of equipments, permitting both electronic analogue and digital computing techniques. Cost is being shared with a firm already established in this field.

Thermionic Generation. During the year, the Corporation agreed to provide financial assistance for experimental work by Prof D. Gabor, of Imperial College, on the direct generation of electricity by a thermionic method.

Fuel Cells. This is one of the Corporation's major projects, and is concerned with both the hydrogen/oxygen cells and another design capable of consuming carbonaceous and hydro-carbon fuels. Development is being continued.

Variable-speed Motors. The Corporation has provided some support for the work being carried out under Prof F. C. Williams at Manchester University on providing variable speed without the use of slip-rings, commutators or brushgear. Work is proceeding with the collaboration of two engineering firms who are building machines.

Narrow-band Television. At Imperial College, work supported by the Corporation is concerned with methods of achieving economy in the frequency spectrum needed for transmitted television signals.

Other work, apart from the much-publicised Hovercraft and flexible oil-container projects, involves a flat c.r. tube for television, high-speed computers and printed circuits.

AROUND THE TRADE

BY PEREGRIN

IN spite of trade depressions, dull weather and sales, January figures have shown quite good results. This year I did not join the band of sales pushers as, apart from refrigerators, I had so little stock needing immediate clearance; refrigerators can be cleared more easily by discreet advertising during spring in the miscellaneous column of the "local rag." The only notable item of news has been the easing of the h.p. restrictions to allow a three-year term of repayments. I doubt if such news will cause any great furore among the ordinary electrical retailers. Three years is a long time for anyone to mortgage his income at a time when industry is feeling the pinch and I should imagine that Midlands dealers, for instance, where the car industry is taking the count, will not want too many long-term credit sales. What is really wanted, of course, is not efforts to ease spending but a genuine hard day's work by everybody concerned and some smaller expense accounts at the top of the scale.

Price Policy

I have heard it suggested that prices of electrical equipment will come down with a rush presently if this trade recession goes on, although so far the tendency is for them to creep up. I doubt whether any small drop would help; prices would have to be slashed very drastically to make any appreciable difference to sales, and I doubt whether two for the price of one really shows profit for anyone in the long run. I should say the best answer is brighter advertising, more attractive shop fronts and a complete overhaul of the interior. The gentlemen of the paintbrush may not be so busy in the near future and may actually welcome orders—although I must admit that I do find myself that on the contracting side I am still stretched to the limit. Incidentally, could not English Electric's full page "Liberator" advertisement have been a little less dull, dismal and depressing and as a result have been more effective?

Refrigerator Design

I notice that the trade recession has not prevented the usual spring rash of new appliances and particularly refrigerators. Many manufacturers have adopted the slim line idea to fit in with the modern small kitchen, so that the refrigerator grows upwards as its capacity increases. I like the Frigidaire range with its plain, clean lines, the door opening within the framework and magnetic closer. English Electric, too, have added to their slim range, which sold well in the past year. Of the other new lines, I like the look of the new Hotpoint automatic washer. If it complies with the best Hotpoint traditions it should be a winner, for over the years Hotpoint machines have been the quietest, most efficient and most trouble-free of their particular class. When there has been trouble of any sort, the company has been most helpful in replacing defective units. Of course, the Bendix is probably the best bet of all for busy people, so I am pleased to hear they have settled their differences quite amicably with their Midlands dealers over the question of discount and service.

Retailing Organisation

And talking of differences, I hear there is a greal deal of niggling talk in certain areas regarding the retail section of the ECA. I think it is time that this section had a new name and a bit better publicity. I am a profound admirer of the work it has done over the last few years—it was a dead loss before the new committee was formed—but the National Electrical Contractors' Trading Association seems quite the wrong name for it to hide under. The small retailer is still, rightly or wrongly, conscious of the snobbery of the ECA towards him, and the difficulty big brother contractor has in taking interest in his troubles. Until the little man can be convinced his interests are really of some importance in high places this bickering and lack of support will go on. There has already been a small injection of new blood in the person of Mr Jones, but a new name—perhaps changing "Contractors'" to "Retailers'" in the present title—would make a big difference to the feeling of the members and, just as important, to anyone considering whether membership is likely to be worth-while.

Retail Training Schools

I hear that Mr Jones has already started work and has been touring the country, meeting and talking to the retailers on sales. The general opinion is that he knows what he is talking about. I hear also that he is interested in a training school for young shop assistants, presumably to be run on the lines of the electricity board colleges. I hope he has experience of this work and its cost, but I am afraid that he will find his way slightly more troubled in starting the same scheme for the retailers.

The boards have several training schools about the country which must have cost them a packet: such money is no object to them. But where are the retailers going to find the £ s d to purchase, equip and staff even one such school? And even having purchased one, how is it to serve the whole country? That is, of course, presuming that the whole country wants such service. My knowledge of my fellow retailers leaves me in some doubt of such a project getting the support it deserves. Again, how is the work of the school to be spread over the year? It is difficult for a retailer to spare staff either during the October to Christmas busy season or during the holiday period.

Perhaps Mr Jones would train a few "locums;" they could take the place of the trainees temporarily and perhaps brighten up the shop trade at the same time. I hear that it has been suggested that the "school" travels the country and takes temporary accommodation in each district. Equipment might be the difficulty here—trainees need to see and learn on more than one make of appliance. However, doubtless the manufacturers would help, as they have at exhibitions in the past. It would certainly be to their advantage, as whatever equipment a salesman fully understands, that equipment he will take a pride and joy in selling.

A.E.I. (RUGBY) LTD.

Progress in Manufacture—1960

SO extensive have been the activities of the three divisions managed by AEI (Rugby) Ltd. during 1960, it has taken a 21,000-word summary to cover just the main items. In this brief survey, therefore, it is inevitable that many interesting achievements will go unrecorded.

Generation and Supply

Hydro-electric generators commissioned during the year include the first of five 90 MW sets for the £130 million Bhakra-Nangal project in the Punjab, the second being due for commissioning early in 1961, two more 100 MW generators for Kariba and six 16 MW generators for McKay Creek, Australia. At Roxburgh, New Zealand, four 40 MW generators are now in service and another four, completing the contract, will be running in 1961. In addition, the first of four 75 MW generator/motors for the Blaenau-Ffestiniog pumped-storage scheme and the first of three 88 MW generators for Belesar, Spain, have passed their tests. Overseas orders for power station auxiliaries have also been well maintained. Among home orders received is one for Drakelow "C" covering the supply of two 10,300 h.p. slip-ring motors to drive standby boiler feed pumps and three 2,750 h.p. s.c. motors to drive booster pumps.

A 2,960 A, 380 V semiconductor (silicon) rectifier is also on order in place of d.c. exciters for each of the 300 MW turbo-generators being built for West Thurrock and, under field forcing conditions, these will be called on to supply up to 5,030 A at 643 V.

In the nuclear field, the 16 3,000 h.p. blower motors for Berkeley have passed test, while work has been started on eight 10,000 h.p. carbon dioxide blower motors for Dungeness.

The 85,000 h.p. turbo-electric propulsion machinery for the P and O liner "Canberra" launched last year is supplied by AEI (Rugby). She is the first all a.c. British passenger liner

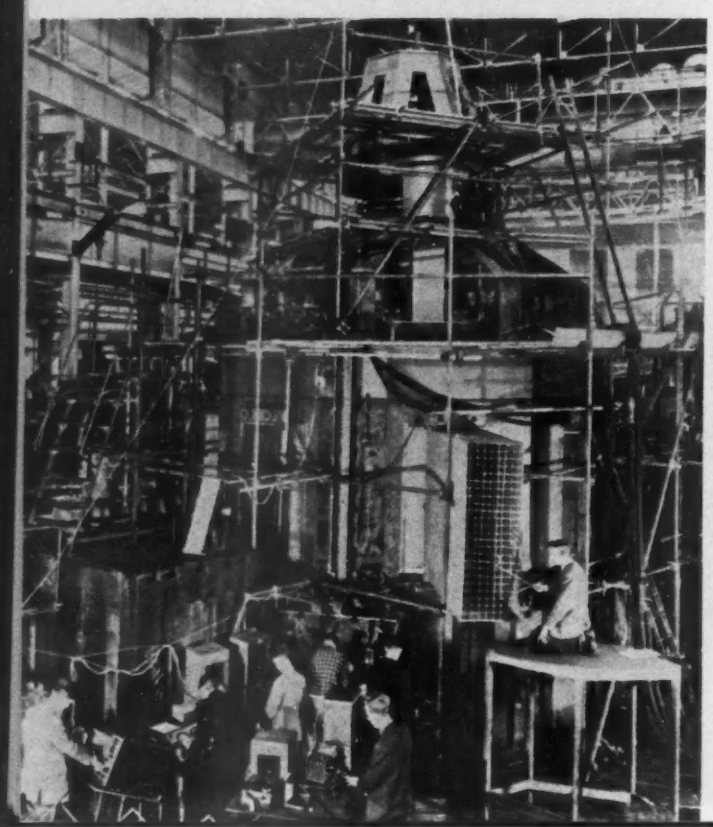
Mining Equipment

Orders for mine winders valued at over £1 million were placed with AEI during the year. One of the largest was for two 5,200 h.p. a.c. geared winders for Buffelsfontein, South Africa, while the biggest d.c. winder, a twin motor unit with Ward-Leonard control, each motor of 2,250 h.p., was also for a S.A. gold mine. In the UK, among the many orders received from the NCB was a 2,800 h.p. tower-mounted unit for Manton No. 4 shaft. Commissionings included the 3,200 h.p. a.c. winder at Abercynon and the 9,000 h.p. d.c. winder at Mosley Common No. 4.

Steel Industries

It has also been an active period for metal industry equipment. Orders received from the steel industry alone exceed £4¼ million in value. Of these, £2 million is for motors and control gear in the Colville mills at Gartcosh. MG and booster sets for a continuous electrolytic tinning line at Port Kemble, Australia, and a number of other contracts for the Llanwern project of Richard Thomas and Baldwins Ltd., the Stockbridge mill of Samuel Fox and Co., GKN rolling mills and the Durham Steel and Iron Co. have also been placed.

Two overseas rolling mills, at Durgapur Steelworks, India, and the Que Que works in Rhodesia, were among those commissioned during 1960 in addition to the outstanding 144 in. hot reversing mill for aluminium sheet at Rogerstone which was completed for Alcan Industries with AEI motors and control gear. Another "first" was the Sendzmir strip rolling mill completed for Birmetals, which was claimed to be the only one of its kind in Europe. At Trostre, South Wales, 20 germanium rectifiers, with an



The first of four 75 MW, 428 r.p.m. generator-motors to be supplied for the Blaenau-Ffestiniog pumped storage scheme on test at Rugby

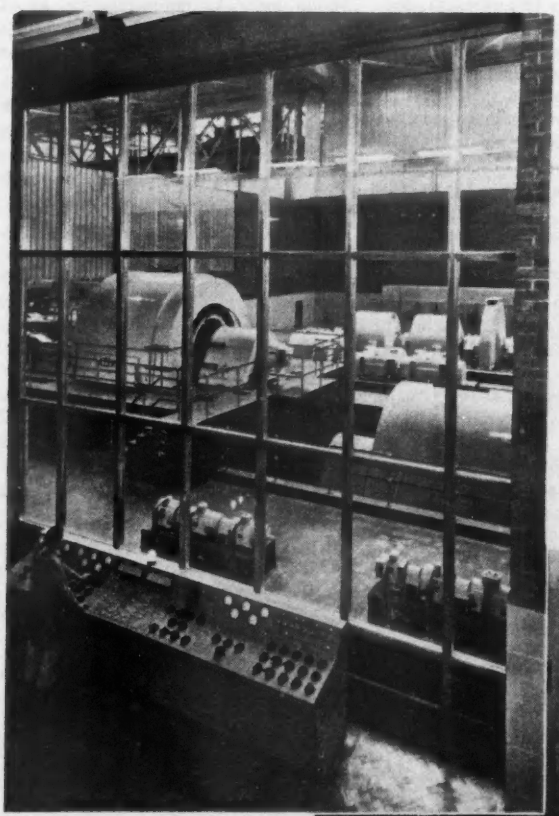
aggregate capacity of 202,100 A, have been ordered for continuous tinplating of steel strip, apart from extensive motor and control gear installations.

The machine tool and textile industries have also been big customers for motors and control equipment.

Paper and Pulp Mills

The paper industry has long been a major user of AEI motors and 1960 has seen the placing of many contracts from mills at home and abroad. Leading these are the £29,000 contract for equipment in the St. Annes Board Mill beater house and a £65,000 order for equipment on two nine-section paper-making machines for Darwen Paper Mills while, among foreign orders, Celulosa Argentina S.A. have called for single-motor drives for their Zarate and Capitan Bermudez mills. From New Zealand, there has been an order valued at between £80,000 and £90,000 for a 16-section d.c. drive board mill at Whakatane, and from Portugal comes a £50,000 order for equipment on the second Caima pulp mill at Constancia.

Commissionings during 1960 include an electrical drive for the reel-up of a spreading machine producing rubber conveyor belting for coal mines at the North British Rubber Co., Dumfries, two winder drives for the Bowater Paper Corporation at Mersey and two sectional drives for the British Cellophane Ltd.



The 8,000 h.p. twin drive AEI motors for the 144 in. reversing aluminium plate mill at Rogerstone

The Ilgner set in the motor room of the 42 in. blooming mill at Durgapur, India—an AEI (Rugby) contract

Oil and Chemicals

The past year was notable for expansion of refineries and chemical works in Britain, for which a great deal of electrical plant and control gear was ordered from, and supplied by, AEI. The Shell Chemical Co's new polypropylene plant at Carrington was responsible for a contract valued at £¾ million in electrical equipment alone. The Esso Petroleum Co. are also erecting a new chemical plant at Fawley and have ordered £200,000 of electrical machinery while, from abroad, a similarly valued contract has been received for a refinery installation at Kalundborg, Denmark.

An interesting new development is the liquid petroleum gas project for transporting natural gas in deep freeze by tanker and a new plant for this purpose, with AEI electrical equipment, is being erected at Kuwait.

Transport

Apart from the extensive electrical activities in rail transport which have occupied the company during the year, perhaps the most interesting delivery was the electric propulsion motors and control gear for the P and O passenger liner *Canberra*, the first British passenger ship to be designed for an all-a.c. electrical system. The vessel was launched last March and is due to sail on her maiden voyage in June this year. A sister ship, the *Oriana*, with conventional steam turbine propulsion and d.c. electrical system, went into service during 1960 with AEI steam turbine-driven air conditioning plant compressors.

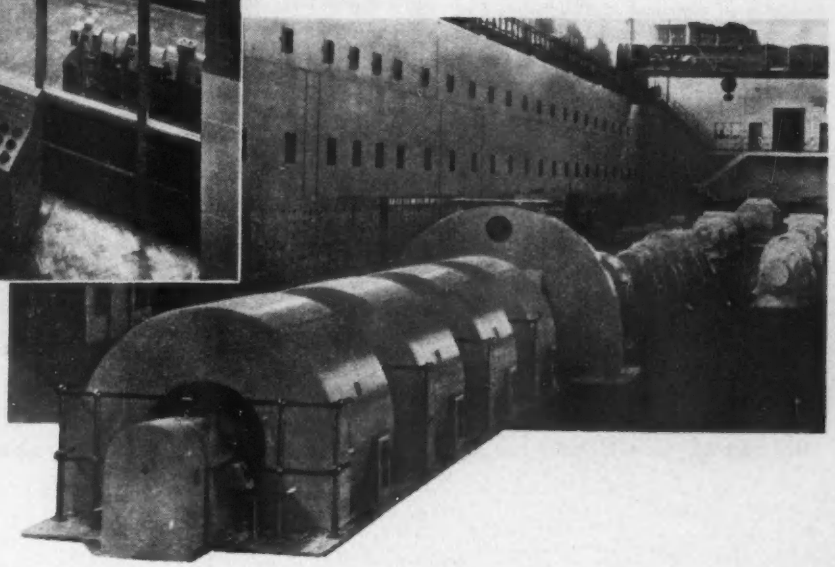
Electronics and Radar

In the electronics field, a noteworthy event was the opening of the new Computer Centre at Sale with the first AEI 1010 data processing system arranged for training of programmers and maintenance engineers and for proving computer customers' own systems.

An important home order was for a data processing system for the Air Force to control spares provisioning, which is believed to be the only one of its kind in the world. Costing £620,000, it will be called upon to handle records for approximately 750,000 items and deal with two million incoming messages each month.

Semiconductor developments have also been expanded and their application to many industrial and telecommunication fields investigated.

In the radar field, the "Escort" marine radar has been demonstrated to many prospective customers and has established its claim to be one of the most advanced of true-course radar appliances.



Personalities *in the industry*

Mr D. Pickup

Mr T. B. O. Kerr

Mr W. W. Grimes

Mr J. Henderson

Mr F. J. B. Barry

At present first assistant district engineer, Clacton District of the Eastern Electricity Board, **Mr D. Pickup,** A.M.I.E.E., is to replace **Mr S. M. Lejeune** as the Board's engineer at Enfield (*ESH, page 110). Mr Lejeune has accepted an appointment in the Chilterns sub-area as we earlier reported. Mr Pickup joined the electricity supply industry in 1940 as a staff apprentice with the Rochdale Corporation Electricity Department and, subsequently, transferred to the North Western Electricity Board where he was employed in the Manchester sub-area's central control. After further experience in Rochdale he took up his present appointment in 1955. Recently he was temporarily transferred to the Northmet sub-area engineer's department under staff development arrangements.

The formation of a Management Committee, and other major appointments, are announced by the General Electric Co. Ltd. **Mr T. B. O. Kerr** becomes deputy managing director and **Mr E. H. Davidson** is relinquishing the position of treasurer of Courtaulds Ltd. to join GEC as financial director from 1 March. Other appointments to strengthen the management are planned, meanwhile a Management Committee has been formed, the members of which are: **Mr Arnold Lindley** (chairman of the company), **Mr T. B. O. Kerr, Mr E. H. Davidson, Mr O. W. Humphreys** and **Mr R. N. Millar.** Mr Kerr, who was educated at Uppingham and Wadham College, Oxford, joined GEC in 1930 as a commercial trainee and subsequently moved to the company's sales department in London. After occupying various positions in the company he was appointed personal assistant to Dr H. Railing—later Sir Harry Railing, a former chairman of GEC—in 1934. Mr Kerr occupied that post for some 13 years and also worked at one period as an assistant to Lord Hirst. In 1947 Mr Kerr was appointed assistant secretary to the company and, two years later, became secretary. He joined the GEC board of directors in 1952 and was made director for finance and administration in 1959. Mr Davidson was born in 1904 and educated at Dulwich College. After qualifying as a chartered accountant in 1927 he joined EMI. He then became chief accountant of Turner Brothers Asbestos Co. Ltd. and later chief accountant of S. Simpson Ltd. He joined Courtaulds Ltd. in 1946, became chief accountant in 1947 and treasurer in 1957. He has been a member of the Taxation and Research Committee of the Institute of Chartered Accountants and several of its sub-committees. He has also been a member of the London and District Society Committee of the Institute. He was a member of the Verdon-Smith Committee set up by the President of the Board of Trade in 1953 to consider the censuses of production and distribution. Mr Humphreys, who has been director of the Hirst Research Centre since 1959, started with the GEC Research Laboratories in 1925. Mr Millar was appointed managing director of the Engineering group last year, after being made general manager of the Erith works in 1948 and a director of the company in 1959.

District manager at Lincoln to the East Midlands Electricity Board since July, 1958, **Mr W. W. Grimes,** M.I.E.E., A.M.I.MECH.E., M.INST.F., A.M.B.I.M., has been appointed deputy manager of the Board's Lincolnshire sub-area as from 1 April. In that position he will be associated with the sub-area manager, **Mr J. P. Tucker,** D.L.C., M.I.E.E. (*ESH, pages 114-5). Before going to Lincoln in 1958 Mr Grimes was district manager to the Board at Chesterfield, the town where he was electrical engineer and manager of the Corporation's undertaking prior to nationalisation of the industry. He joined that undertaking as consumer's engineer following several years' service at West Ham.

Mr J. Henderson, M.I.MECH.E., M.I.P.E., M.N.E.C.INST., A.M.I.W., has been appointed general works manager of C. A. Parsons and Co. Ltd. in succession to **Mr W. Winter,** who retired on 31 Dec., 1960.

Mr W. M. Chapman-Walker, C.B.E., M.V.O., M.B.E., who has been associated with the London organisation of Aerialite Ltd. for a number of years, has now been appointed a director of the company. He was the first managing director of Television Wales and the West and is the joint managing director of the News of the World Organisation Ltd. He represents Aerialite and TWW on the board of Wirevision Ltd.

Secretary of the Yorkshire and North Derbyshire district of the National Union of General and Municipal Workers, **Alderman J. W. Sterland,** M.B.E., J.P., has been appointed a part-time member of the Yorkshire Electricity Board as from 1 April next (*ESH, page 141).

Manager of the General Electric Co.'s Plant Liaison Department in London since 1955, **Mr F. J. B. Barry** has been appointed commercial manager of the firm's engineering works at Witton. He was closely connected with the inquiry into some sections of the electrical industry by the Monopoly Commission and serves on a number of the industry's committees. Born at Christchurch, Hants, Mr Barry was educated at Felsted School

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* *Denotes revision to the "Electricity Supply Handbook, 1960."*

and joined the Metropolitan-Vickers Electrical Co. as a school apprentice in 1923. On finishing his apprenticeship he joined the sales staff and served in the Marine Department, the Turbine Sales Department and, in 1936, in the newly formed Special Contracts Department dealing with defence contracts. Seconded to the Ministry of Supply in 1942 he was appointed Deputy Director of Weapon Production, returning to Trafford Park in 1945 as assistant sales manager of the Plant Department. He was promoted to sales manager in 1949.

Having retired from the RAF at the end of January (where he was in charge of a specialist unit handling electronic equipment), **Wing-Commander A. Strutt,** O.B.E., F.R.A.S., F.B.I.S., has joined James A. Jobling and Co. Ltd., in the newly created post of general manager of the Electrical Products Department. To be directly responsible to **Mr W. H. Hooper,** executive service and development director, he will be based at the Pyrex headquarters at Sunderland, where a 20-acre site alongside the River Wear is now being cleared for the construction of a £200,000 electronic components plant.

A director of Crompton Parkinson Ltd. since 1939, **Mr Charles F. Dickson,** O.B.E., has been appointed a vice-chairman. He was sales director of the company until July, 1953.

Following the recent retirement of **Mr R. C. Burton** after 50 years' service in the electricity supply industry, **Mr J. T. Lornie,** A.M.I.E.E., has been appointed senior assistant engineer (technical development) at the headquarters of the Merseyside and North Wales Electricity Board. Mr Lornie was formerly senior assistant commercial engineer (industrial supplies) and has been succeeded in that post by **Mr W. C. Dobie,** A.M.I.E.E., who was previously second assistant engineer (planning). The Board also announce that **Mr G. G. Barnes,** A.C.A., at present assistant accountant in No. 2 sub-area, has been promoted to accountant for No. 3 sub-area based at Chester, where he will succeed **Mr R. Bennett,** O.B.E., A.S.A.A., F.I.M.T.A., who is shortly to retire (*ESH, page 138).

Previously with Thorn Electrical Industries Ltd., **Mr Geoffrey Cole** has this month joined the General Electric Co. Ltd. as advertising manager of the Lighting and Heating Group. With Thorns, Mr Cole was advertising manager of Atlas Lighting Ltd. and he earlier worked with several prominent advertising agencies. He is also a member of the Publicity Committee of the Illuminating Engineering Society.

Mr T. K. Singer has been appointed general sales manager of James Booth Aluminium Ltd. following the resignation of **Mr D. McL. Burnell.** Mr Singer has had wide experience of selling and sales administration in the aluminium industry. He was formerly an executive with Kaiser Aluminium and Chemical Corpn. and has represented that company both in the USA and in this country. **Mr F. J. Mills** continues as sales manager of James Booth.

At the ASEE Central London branch dinner/dance. From left to right: Mr E. A. Bromfield (general secretary) and Mrs Bromfield, Sir Willis Jackson (president), and Lady Jackson, Mr W. L. T. Nicholson (branch chairman) and Mrs Nicholson

Two new appointments are announced by the South of Scotland Electricity Board. **Mr F. Anslow,** ASSOCIATE I.E.E., becomes engineer of the Ayrshire area and **Mr W. H. Howard,** M.I.E.E., is promoted to a similar position for the Stirling area (*ESH, pages 165 and 170). Mr Anslow has been deputy area engineer of the Ayrshire area since 1950, and from 1933 to 1948 served with the former Ayrshire Electricity Board. Mr Howard succeeds **Mr H. A. Carson,** M.I.E.E., F.R.S.A., M.INST.F., who is retiring. Mr Howard served with the Dundee Corporation Electricity Dept. and the North of Scotland Hydro-Electric Board from 1936 to 1949 and with the South West Scotland Electricity Board from 1949 to 1953. He has been deputy area engineer, Glasgow area, since 1953. Mr Carson started with the Power Department of the PO at Leeds and, following a short period with the Yorkshire Electric Power Co. and war service, joined the Scottish Central Electric Power Co., of which he became deputy manager in 1946. From 1948 to 1955 he was sub-area engineer with the South East Scotland Electricity Board.

Mr R. B. Coulson, sales manager of the English Electric Valve Co. Ltd., left London Airport on 23 Jan. for an export sales tour which will include USA, Canada, Australia, New Zealand, Japan and Ceylon.

We learn of several new appointments on the sales staff of Burco Ltd. **Mr J. Cropper,** formerly responsible for retail sales development, has been promoted to field sales manager in charge of all Burco field sales personnel. **Mr A. C. D. Burbidge,** formerly area manager for the North West, has been promoted Southern Divisional sales manager and will be responsible for all sales matters and personnel in London, the Southern and South Western counties, East Anglia and South Wales. **Mr F. A. R. Sturman** has been promoted to sales liaison manager at headquarters to directly assist the general sales manager, Mr K. B. Holman. He was formerly area manager for the South East, which is now the responsibility of **Mr E. R. Stickley.** In addition, four field supervisors have been made. These are: **Mr J. A. Prange** (London area), **Mr J. Power** (Midlands), **Mr E. R. Waddilove** (Yorkshire) and **Mr J. Wilson** (Lancashire).

Technical director of the Brush Electrical Engineering Co. Ltd., **Mr J. H. R. Nixon,** M.I.E.E., M.I.MECH.E., F.B.I.M., is to receive an honorary M.A. degree at Nottingham University on 7 July.

Mr P. F. J. Trollope, A.M.I.MECH.E., M.I.MAR.E., has been appointed to the board of Hawker Siddeley Brush Turbines Ltd. with the title of works director. Mr Trollope's considerable experience of steam turbines and marine machinery includes three years in the Devonport Dockyard. After 26 years in the Royal Navy he retired in 1957 with the rank of Commander and became works manager of the Turbine Division of the Brush Electrical Engineering Co. Ltd., subsequently becoming personal assistant to the managing director on special projects. He left the company in 1960 to join the Administrative Staff College, where he was three months on the directing staff before joining HSBT.

Mr C. F. Dickson

Mr G. Cole

At present Secretary to the Federation's Minister of Economic Affairs, **Mr James Ward** will be the new chairman of the Federal Power Board of Rhodesia and Nyasaland in succession to **Sir Duncan Anderson** who is to retire on 10 June. Mr Ward will be chairman only and act in a part-time capacity.

From the Hortsmann Gear Co. Ltd. we hear that **Mr F. O. Hortsmann,** formerly managing director, has been appointed chairman from 1 Feb., succeeding **Mr C. A. Mant** who becomes vice-chairman. In addition, **Mr F. A. Wheeler,** secretary of the company becomes a director, and **Mr D. W. Nicholds,** recently works manager, becomes works director.

Mr W. Briggs, director and manager of the Contracts and Sales Department of Erskine Heap and Co. Ltd., following a period of ill-health, has retired after 51 years' service. **Mr G. Webb** who has been assistant manager for several years, takes over as manager of the department.

Mr R. W. Chapman, GRAD.I.E.E., has joined the Electric Construction Co. Ltd. as senior sales engineer for the Yorkshire area.

Mr Ken Wood, managing director of Kenwood Manufacturing (Woking) Ltd., and **Mr A. C. Brooking,** the secretary of the company and financial director, are now on a three-week tour of the United States and Canada.

Formerly technical sales manager of the Fan Department of Sturtevant Engineering Co. Ltd., **Mr C. E. Knight** has taken up an appointment in the Marketing Department of the National Coal Board at Hobart Hse, where he will be engaged in work concerned with the development of solid-fuel burning appliances and equipment.

Mr Malcolm T. Rimmer, A.C.A., has been appointed secretary and accountant of Fawcett Preston and Co. and secretary of the New Eagle Foundry Co., both members of the Metal Industries group.

Mr Raymond Hutton has been appointed representative for the Carron Co. for the sale of domestic electrical appliances in the North East England area.

Mr J. Arthur Reavell has been appointed president of Kestner Evaporator and Engineering Co. Ltd. and has retired as chairman. **Mr B. N. Reavell** has been appointed chairman and **Mr G. H. Black** managing director. **Mr C. A. Pither** becomes director and secretary following the retirement of **Mr W. S. Knight.**

Managing director of Baird and Tatlock (London) Ltd., **Mr J. E. C. Bailey,** C.B.E., is leaving the UK on 5 Feb. for a business tour of Africa and is due to return on 4 March.

Mr A. Elliot, A.M.I.EX., who has held the position of export manager for Baird and Tatlock (London) Ltd., with whom he has served for 23 years, has now been appointed general sales manager of the associated company, W. B. Nicolson (Scientific Instruments) Ltd. in Glasgow.

Mr B. B. Mann has joined the sales representation staff of Electrical Remote Control Co. Ltd. and will be concerned with their technical advisory service on the application of process timing equipment to industry.

The Shawinigan Water and Power Co. announces that **Mr J. M. Sharpe,** formerly manager of the Power Operations and Engineering Department, has been appointed executive assistant, production and power operations. In addition, **Mr R. F. Brooks,** formerly superintendent, power operations in the Power Operations and Engineering Department, has been named manager of the newly formed System Operating Department.

The Hydro-Electric Commissioner of Tasmania, **Mr A. W. Knight,** has been elected deputy chancellor of the University of Tasmania.

As from today, 2 Feb., **Mr D. E. Fox,** B.SC., M.I.MIN.E., A.M.I.MECH.E., A.M.I.E.E., becomes HM Principal Electrical Inspector of Mines and Quarries, succeeding **Mr J. Cowan,** C.B.E., M.I.MIN.E., M.I.E.E., who retired on 1 Feb. Mr Fox was educated at Amman Valley Grammar School and University College of Swansea, where he graduated in 1939. He completed a two-year post-graduate course with the General Electric Co. Ltd. and from 1941 to 1946 was employed by the Ministry of Supply where he held various technical posts. He then spent a year with Powell Duffryn before joining the National Coal Board as group electrical engineer in 1947. Entering the Mines Inspectorate in 1949 as an electrical inspector of mines and quarries, he served in the South Western Division until 1957 when he was appointed deputy principal electrical inspector and transferred to headquarters. Mr Fox is a past-president of the South Wales branch of the Association of Mining Electrical and Mechanical Engineers. Mr Cowan, who has just retired, has been principal electrical inspector since 1949, after being deputy for six years. Earlier he had spent 13 years as electrical inspector of mines and quarries in various parts of Gt. Britain. A Scot, he gained early training with the Fife Coal Co. and as an electrical engineer (mining) with the Carron Co.

Sales director of Doulton Industrial Porcelains Ltd., **Mr M. C. Blythe** left London on 30 Jan. on a visit to Australia. He will also be spending some time in Karachi, Calcutta, Singapore, Kuala Lumpur, Wellington (NZ) and Johannesburg.

Formerly with the Sorensen Division of J. Langham Thompson Ltd., **Mr A. B. Tilleray** has joined Thorn Electrical Industries Ltd. as sales manager of their Industrial Control Division. He will be responsible for marketing electronic and electro-mechanical control equipment and systems developed and produced by Nash and Thompson Ltd. and the Electronics Division of Ferguson Radio Corporation Ltd.

George Kent Ltd. have appointed **Mr Rodney Kent** to be deputy chairman and **Mr W. May** is assistant managing director. In addition, **Mr J. G. Vaughan,** F.C.A., managing director of the Charterhouse Finance Corporation, becomes a director of the company.

Mr James F. Hannah has been appointed a director of the Perak River Hydro-Electric Power Co.

Mr Geoffrey F. Cutting has taken up the position of director of the Association of Heating, Ventilating and Domestic Engineering Employers as from 1 Feb.

OBITUARY

Mr H. Kirkwood, secretary of the Accumulator Manufacturers' Association and of the British Starter Battery Association, died on 19 Jan., aged 54.

Mr L. Parsons, a member of the South Wales Electricity Board since 1948, and managing director of Treffgarne Quarries Ltd., died on 22 Jan., aged 61 (*ESH, page 129).

Prof Francesco Giordani, who was, from 1952 to 1956, chairman of the National Council for Nuclear Research and led the Italian delegation to the international conference on the peaceful use of nuclear energy at Geneva in 1955, died in Naples on 24 Jan., aged 64.

Mr R. Wright, M.B.E., M.I.E.E., A.M.I.MECH.E., who died recently, aged 59, went out to Madras as assistant power station engineer in 1928 and was promoted to station superintendent in 1943. When the undertaking was nationalised in 1947 to form the Madras Government Electricity Department, he was appointed generation superintendent for thermal electric power. In 1951 he joined Buckingham and Carnatic Co., owners of cotton mills in Madras, as deputy chief engineer and in 1954 was promoted to chief engineer.

Mr C. J. G. Bennett, A.M.I.E.E., formerly Electricity Works manager to Petters Ltd., Yeovil, died on 27 Jan.

Mr A. L. Sharpe, who represented Berry's Electric Ltd. in N.E. England for 36 years died on 19 Jan., aged 58.

Mr A. McDougall, M.B.E., M.I.E.E., formerly chief electrical engineer with the Anglo-Iranian Oil Co. Ltd. at Abadan, died at Hove on 27 Jan.

AUTOMATIC MACHINE-TOOL CONTROL

THE vexed question of reliability was again to the fore in last Tuesday's discussion arranged by the IEE on automatic control of machine tools. Theme of the discussion, opened by Dr E. H. Frost-Smith, was concerned mainly with mechanical aspects of co-ordinate position measurement and control as related to machine tools, rather than circuit techniques associated with servo-control feedback loops.

Economic Aspects

For commercial users of automatic machine tools, reliability of the equipment must, for economic reasons, take first priority. Against the cost of interruptions to production programmes resulting from down-time must be weighed the cost of reliability in terms of equipment maintenance and depreciation. Skilled maintenance staff were not always readily available and, in the case of smaller firms, their employment would mean a burdensome expense. One speaker estimated that depreciation rate of equipment could not, at the present time, be expected to exceed much more than three to five years. This limit was set by the rate of wear of components such as relays and lead-screws. A desirable feature of control equipment would be "self-checking" ability, but this again would involve additional expense and could possibly create a vicious circle by virtue of greater complexity increasing the probability of failure. What was essential, however, was inherent failure to safety.

Lead-screw Measurement

Apart from reliability, the other important factor dictating the limitations of automatic machine-tool control was the physical means available for measurement of the position of the work-piece relative to the tool head. A number of the methods employed in practice depend upon measuring linear travel in terms of angular rotation of some form of lead-screw. Final accuracy must, therefore, depend very largely upon the mechanical characteristics of the lead-screw and nut. A case in point was non-linearity of screw-pitch over long distances of travel due to lubricant build-up. This effect had been largely overcome by the adoption of pressurised lubrication. Similar problems arose in maintaining accuracy of the actual machining process. Errors could result from tool chatter, gear-train back-lash, thermal expansion and lack of rigidity of the machine bed or frame.

Optical Methods

There were several ways in which feedback measurement signals could be derived. These were mainly electromagnetic, electrostatic and optical in principle. In this country the NPL had carried out a good deal of research on the use of optical methods of machine-tool measurement, making use of the moiré fringe effect produced by two or more optical gratings. Moving fringes, each representing a small increment, are counted electronically, converted and fed back as signals to the servo-loop. Typical accuracy quoted for one variation of the method, using a coarse grating of 100 line/in., was 1/10,000. Electromagnetic methods had also received attention in the UK, one disadvantage cited being the possibility of error due to interference pick-up.

The use of automatic machine-tool control in this country is still in its infancy, a fact which was evident in Dr Frost-Smith's opening remarks. Even out of the relatively few equipments which had been designed, he estimated that only about 10% had passed the prototype stage. Before any real development could be made it was essential for designers of the equipment to have design data available based on commercial operating experience. This was not possible unless British manufacturers were prepared to take the risk of experimenting with such equipment and to accept early teething troubles as part of the price progress. In this context, several speakers referred to the difference in attitude of US manufacturers who were always ready to adopt the latest methods.

BETTER BOILER CODES

POWER station developments, both nuclear and conventional, are placing an ever-greater demand on boiler makers. The increasing pressures and temperatures to be provided have introduced new problems for designers, and many of these were discussed recently at a symposium, "Pressure Vessel Research—Towards Better Design," arranged by the Institution of Mechanical Engineers in co-operation with the British Welding Research Association.

Design in the Future

Many of the papers are of specialised design interest, but two, dealing with boiler codes generally first and then with pressure vessel design in the immediate future, have importance for a wider audience. The latter paper was contributed by Dr W. B. Carlson (Babcock and Wilcox Ltd.). He argues that currently used factors of safety make truly economic pressure vessel designs impossible. At present these factors are of the order 4½ to 3 on ultimate tensile strength and 2 to 1½ on yield or creep rupture stress. They give no incentive for major improvement in design. Dr Carlson suggests that the basic design stress in codes should be raised to the highest value permissible for pure membrane stress, with no deliberate or accidental stress intensification. Idealised steady temperature and pressure would also be assumed. There would then be separate provision for each single departure in a design from pure membrane stressing and temperature and pressure.

Implied in such a change in boiler codes would be the undertaking of research to determine the real effects of departures such as those discussed in relation to modes of failure against which large pressure vessels have to be designed. The basis of the initial pressure test applied to a boiler would need to be changed so that it demonstrated features particular to individual designs. Underlying this suggested approach is the assumption that superior designs would make the number of "departure factors" steadily fewer in number.

Boiler Codes Compared

The paper on boiler codes was contributed by Mr J. F. Lancaster (Kellog International Corporation). He noted wide differences in the degree of local authority given to the codes and in their scope. Yet experience suggests that this difference is not reflected in different levels of safety achieved by pressure vessels built in different countries. Safety standards are almost uniformly high.

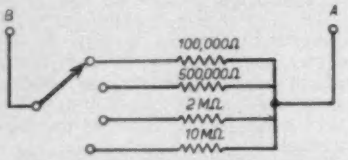
Despite broad agreement as to the essential for sound design, there is a difference in permissible stress between two groups of countries. One limits design stress to one-quarter of ultimate tensile stress, while the other permits two-thirds of the yield point or proof stress of the material. General experience provides no evidence of any greater incidence of failure with either one or other of these design criteria. Great Britain and France are exceptional in that although national codes exist, no single code is either officially recognised or universally accepted. In neither country is one code-administrating body recognised to the exclusion of others.

Mr Lancaster concludes that establishment of a single boiler and pressure code with a single administrative body would be the most desirable step towards standardisation and economy. Any development towards increasing permissible stress ought to be secondary to unification and strengthening of existing codes.

Amongst the others papers was one on the problem of low-temperature brittleness, which has been a factor of some concern in the design of pressure vessels for nuclear power stations. In this paper, Mr. J. W. Strawson (Shell Refinery Co.) says that fundamental knowledge in this particular field is at present insufficient to meet the designer's needs.

PROBLEMS AND PRACTICE

We welcome contributions to this feature; those published will be paid for at our standard rates. There must be many problems encountered in day-to-day electrical work, or useful ideas or tools devised to make it easier; all make instructive reading.



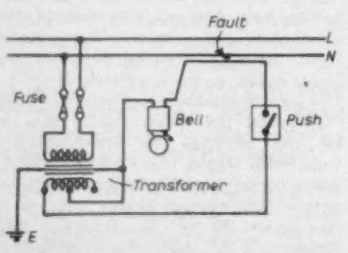
A useful sub-standard for checking ohm-meters devised from standard radio components

Resistance Sub-standard

IT is practice in many works to take insulation tests of equipment at regular intervals. At the works where I am employed I was disturbed to notice that the insulation resistance on one large machine had dropped from 6 MΩ to 1½ MΩ in a very short period. On investigation I discovered that the tests had been carried out with different instruments and, on checking, one gave 6 MΩ when the other gave 1½ MΩ. As there were some 14 testing instruments in use in the plant, which were sometimes subject to accidental misuse, the following simple resistance sub-standard was devised for checking them. It comprised a box with two terminals, a selector switch and four resistance elements connected as shown in the diagram. The resistance elements were high tolerance radio components and the device was relatively cheap and simple to assemble. All instruments are now checked at the four points before use on the sub-standard and any which are damaged or out of calibration are returned to the instrument room for repair.—*M. H. Hepworth.*

Bell System Fault

A HOUSE, divided into nine one-room flatlets, was provided with a miniature low voltage a.c. bell in each room controlled from a push at the front door and fed from a 5 VA bell transformer with the secondary mid point earthed. A call was received stating that the bell in one room was not working.



Neutral out-of- balance current was responsible for the burn-out of an a.c. bell on this unusual fault

Examination disclosed the coil badly overheated and the polystyrene case partly melted away. Assuming that the transformer output was insufficient for such overheating and that the cause was from some external source, the bell was replaced.

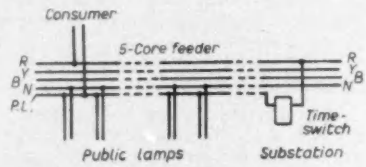
Some weeks later another call was received and the replacement bell was found in the same condition. This warranted further investigation and a close examination of the circuit was made. The only fault that could be found was a nail securing newly laid flooring which had pierced the neutral from a lighting circuit and also the return wire in the bell circuit (see diagram). Since the removal of this cured the fault, one can only assume that the out-of-balance potential of the neutral conductor above earth at this point was responsible for the passage of a current which was not large enough to ring the bell but, over a long period, was sufficient to cumulatively overheat the winding.—*E. Copeland.*

Emergency Trip Wire

THE provision of an adequate number of stop-buttons along a mineral picking belt can present several problems. A stop-button against each operator can be costly and also introduce extra chances of electrical failures. Even if the push-button circuit is arranged to fail to safety, dirty contacts or breaks in the wiring can cause a hold-up. Furthermore, it is very easy for the difficult operator to give a surreptitious push to his stop-button.

All things considered, it was decided to install a mechanical trip wire consisting of ¼ in. dia flexible wire rope running through guide brackets, made from ¼ in. conduit accessories. The atmosphere being hot, dry and very dusty, graphite lubricated brass sleeves were made and fitted to the guide brackets, suitable brass rod being turned, drilled, bell-mouthed and then drilled about the middle with several small holes. These sleeves were mounted in the guide brackets as shown and, before fixing the brackets, powdered graphite was poured into the vertical piece of conduit and sealed by a wooden plug.

The trip wire operated a pivoted arm mounted on the lid of the oil circuit-breaker controlling the driving motor, which, in turn, operated the push-button. In rugged surroundings a lot can be said for this sort of layout. The dimmest operator can see how it works and failure can only be brought about by destruction of trip wire or guides, such mishaps being at once apparent.—*R.S.*



A consumer's neutral connected to the public lighting core of a distributor produced some unexpected happenings

Mysterious Fault

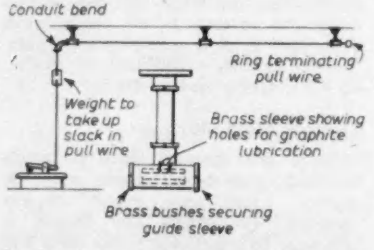
WE didn't really believe the man who telephoned to say that when the street lights came on, his supply went off, but in sheer curiosity we sent an engineer to investigate. He soon discovered that there was no neutral supply to the premises and, as the distribution mains in the area had recently been renewed, an examination of the service joint to the premises was made. The new distributor cable was a five-core, including a public lighting switch wire, and it was soon discovered that the service neutral had been connected to the public lighting switch wire and not the neutral.

During the day the return to the neutral from the house was via the street lamps in parallel, but as soon as dusk fell and the switch wire was energised, the unfortunate consumer lost his supply. —*J.P.*

[*This is not so unusual an occurrence as might be supposed. This particular consumer happened to be fortunate in that the timeswitch at the substation was coupled to the same phase as the consumer, as the diagram shows. Had it been connected to another phase, then there would have been fireworks!*—ED.]

Lighting Circuit Hazard

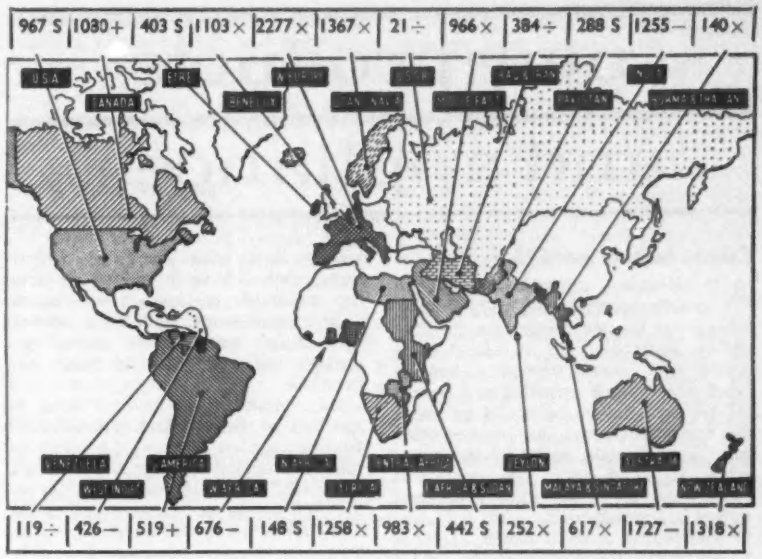
E.L.O.'s experience (22 Dec.) seems to strengthen the case for universal multiple earthing of the neutral, but a disconnection in the board's neutral would almost certainly persist unnoticed unless a monitoring device was installed. —*R. St. C. Ison.*


Conduit bend
Ring terminating pull wire
Weight to take up slack in pull wire
Brass sleeve showing holes for graphite lubrication
Brass bushes securing guide sleeve

For certain surroundings an emergency trip wire is preferable to a series of stop-buttons

Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures.



EXPORTS IMPORTS *December*

ALTHOUGH £3 million down in value on the previous month, exports of electrical goods during December topped the £24 million mark and were slightly above the average for the whole year. In the December figures, listed alongside, it will be seen that the heavy plant section dropped over £100,000 in value compared with a year ago. Domestic appliances were again responsible for the major improvement, exports of washing machines and refrigerators continuing at a high level. Exports of cookers and toasters, too, were considerably higher than in November, but those for vacuum cleaners declined slightly. Australia was our best customer for the month taking goods to a value of £1,727,902, of which £239,943 was in respect of generators and motors and £293,730 for converters, rectifiers, transformers and switchgear. Second in the list is New Zealand with £1,318,776, followed by India at £1,255,485.

Imports of electrical goods, at £4,893,885, were nearly £700,000 down on the previous month, of which some £300,000 is due to smaller imports of radio and electronic gear.

Total value of exports during 1960 of all electrical goods listed in our table reached the massive figure of £267,998,418, of which the heavy plant side accounted for £67,847,995 (compared with £72,416,844 in the previous year). Domestic appliances exports in 1960 jumped to £31,972,838 from the previous year's figure of £24,618,564.

Description	Exports Value (£)		Imports Value (£)	
	Dec. 1959	Dec. 1960	Dec. 1959	Dec. 1960
Generators				
Diesel up to 200 kW	360,103	480,014		
Diesel over 200 kW	285,395	181,501		
Steam turbine driven	45,013	62,655		
Water and gas turbines	589,973	358,183	160,086	268,327
With i.c. and other prime movers	22,556	137,162		
Generators up to 200 kW	91,667	96,375		
Generators over 200 kW	327,158	41,443		
Generator parts	600,078	762,448		
Motors, f.h.p.	252,295	347,540		
Motors 1-250 h.p.	526,983	444,927	172,897	188,000
Other motors	534,091	373,324		
Motor starters and controllers	293,660	262,685		
Converters and rectifiers	100,227	109,516	88,118	243,620
Transformers	616,053	745,354		
Switchgear, to 200A, mv	325,900	495,230	110,078	124,596
Switchgear, other	1,312,823	1,269,023		
Total, Electrical Plant	*6,283,975*	*6,167,350*	*531,179*	*824,543*
Batteries, primary and parts	637,974	703,822		
Lamps filament, over 28 V	105,147	108,066		
Lamps filament, under 28 V	37,345	30,634		
Fluorescent and other lamps	107,378	137,363		
Radio and electronic gear	3,707,689	3,948,666	1,700,501	1,464,060
Telephone and telegraphic equipment	1,902,866	1,650,497		
Cookers	51,222	71,432		
Toasters	25,788	31,205		
Other cooking appliances and parts	138,217	137,204		
Space heaters	37,399	26,843	130,302	216,080
Water heaters	34,564	41,105		
Other heaters and parts	123,327	169,119		
Electric irons	80,621	109,121		
Vacuum cleaners	186,078	259,862		
Floor polishers	78,862	83,692		
Food mixers	67,072	152,633		
Washing machines, domestic	444,809	726,299		
Dryers		33,133		
Washing machine and dryer parts	83,616	140,930		
Domestic refrigerators and parts	519,418	752,318	304,812	122,343
Other appliances and parts	313,848	427,686		
Total, Domestic Appliances	*2,184,841*	*3,162,582*		
Portable power tools	245,150	337,877		
Arc welding plant	115,191	93,854	50,804	78,916
Resistance welding plant	19,912	26,898		
Electric furnaces	64,795	105,096		
Signalling apparatus	112,223	186,009		
Commercial instruments	148,240	199,493	179,888	153,829
House service meters	150,024	189,422		
Wiring accessories	219,091	259,779		
Fans	95,132	136,220		
Lighting fittings and lanterns	351,474	357,165	158,637	179,970
Other lighting equipment	107,763	93,063		
Telephone and telegraph cable	464,564	302,238		
Paper insulated cables	587,741	479,704		
Rubber insulated cables	248,440	288,629		
Thermoplastic insulated cables	263,581	284,462		
Winding and similar wires	122,053	236,580		
Other cables and wires	162,860	245,605		
Total, all cables and wires	*1,849,239*	*1,837,218*		
Accumulators and parts	322,760	338,277		
Insulating materials	256,259	234,950		
Industrial electronic control gear	133,694	168,598		
Electrical ware	78,941	161,826		
Permanent magnets	59,283	70,853		
All other articles	2,498,859	3,318,055	1,507,473	1,854,144
Total	21,795,245	24,023,633	4,571,596	4,893,885

new products and appliances

Central heating for £175

AN all-electric central-heating system installed complete for £175 is being offered by Gnome Heaters, a firm set up by Polymatic. Air is heated in a central unit, passed through a humidifying chamber and propelled by a powerful fan along ducts to outlet grilles in the respective rooms. An ideal position for the unit might be under the stairs, where it could serve two downstairs rooms and the lower hall. Total heat output is approximately 31,000 B.Th.U's/hr with control down to 26,000, 22,000 or 17,000. Room thermostats, safety cut-out and automatic clock capable of switching the heater on or off at predetermined times are incorporated.

This system combines the characteristics of well-controlled electrical heating with a humidifying air-circulation system. No flue is necessary, the unit requires relatively small space and remains useful during summer months to circulate cool air. Dimensions of the central unit are 3 ft high by 1 ft 8½ in. deep by 1 ft 5 in. wide. *Gnome Heaters (Sales), 1 Cater St, Bradford.*

Refrigeration by battery

THAT rare commodity, the battery-powered refrigerator, is in the news again as Lec introduce two models, of 2 cu ft and 4·2 cu ft capacity. They are compressor-operated types, employing a transistorised inverter (d.c./a.c.).

The smaller model, "Mariner," has a shelf area of 3·6 sq ft plus butter and egg rack in the door and a freezing compartment accommodating six plastics ice cube cups. Its dimensions are 27½ in. high by 21 in. wide. The larger "Helmsman," with 5·7 sq ft of storage area, has adjustable shelves as well as the door compartments. Both these cabinets are easily transportable and light enough for installation in boats and caravans.

D.C. input to the inverter must be specified as both models are available for operation on 12 V or 24 V. Only list prices are available so far and these are: "Mariner," £27; "Helmsman," £30; and the unit, known as "Transvertor," is £21. *Lec Refrigeration, Bognor Regis, Sussex.*

The grind out of pepper-grinding

THOSE who prefer an on-the-table pepper-grinder and dispenser may find the battery-operated model, just introduced, a novel step torwards more effortless living. The grinder is of more or less conventional shape—a slim, contoured body about 8 in. high made of cherry wood, with a brass push-button control at the top. The body unscrews at a brass middle belt for the insertion of peppercorns. Known as "Peppy," the grinder sells at £2 12s 6d. It is available from the distributors: *General Trade Equipment Ltd., 82-90 Seymour Pl, W.1.*

Coal-effect fire

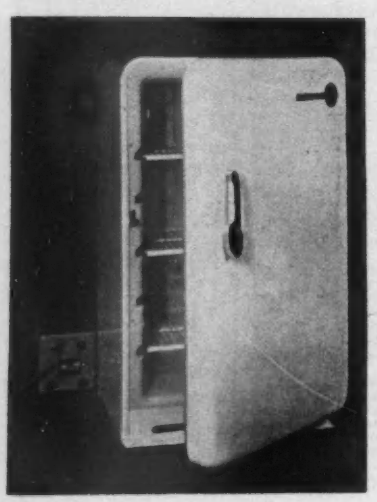
A NEW coal-effect fire for installation in existing fireplaces is now available. It has two 1 kW radiant elements mounted above a washable coal-effect. An unusual detail of its design is the grille above the elements. This provides an outlet for air convected from behind the reflectors. The coal-effect is surrounded by a vitreous enamel "grate" and the whole outer casing, in vitreous enamelled cast iron, is square-cut and slim enough to fit within the smallest fireplace. Two switches control the elements, whilst the coal-effect is lit immediately the fire is connected and the usual mechanism provides a flicker. Dimensions are: 21½ in. high, 15½ in. wide and 9½ in. deep. Price, tax paid, £11 19s 7d. The fire is known as "Enchantress." *Chatwins Ltd., Market and Phoenix Foundries, Tipton, Staffs.*

PO type relays

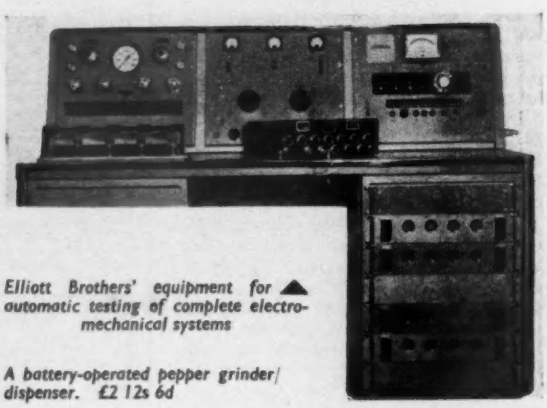
A RANGE of PO type relays previously available have recently been given approval to Joint Services Specification, RCS 161, it is announced. They can be supplied with coil resistances up to 40 kilohms, having double, treble or sandwich windings and with contacts of either fine silver, platinum or silver/cadmium oxide. Operational delays of up to 500 milli-sec can be obtained, power consumption being 0·02 to 0·05 W. *B and R. Relays Ltd., Temple Fields, Harlow, Essex.*

Automatic test and servicing gear

ORIGINALLY designed for complete testing and servicing of aircraft auto-pilot systems, equipment which has been recently introduced, could also be adapted for testing other electronic and electro-mechanical systems. It comprises a twin console, one half for checking electronic components and circuits, the other half being a test unit for hydraulic systems. For electrical testing, having connected up the various circuits to the equipment, each test is carried out automatically in numerical sequence simply by the operator depressing a key. Results of each test are indicated on a single meter on the upper facia, expressed as a percentage error. Numerical tubes display the actual percentage error allowable for any particular test. If required, the operator can repeat any test in the numerical sequence by throwing the key in reverse and dialling the test number required. This is a useful feature when returning to check rectified faults during routine servicing. The equipment caters for a total of 350 different tests and is said to be able to handle unit assemblies either singly or in combinations of up to 33. *Elliott Brothers (London) Ltd., Lewisham, S.E.18.*

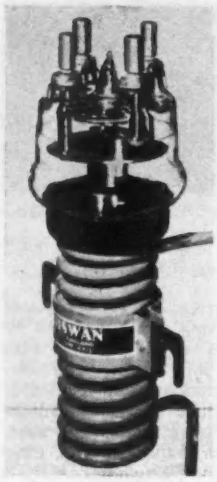


◀ Lec's new battery-operated fridge "Helmsman"; 4.2 cu ft capacity



Elliott Brothers' equipment for ▲ automatic testing of complete electro-mechanical systems

◀ A battery-operated pepper grinder/dispenser. £2 12s 6d



New RF power valve manufactured by AEI incorporates spiral copper tube for water cooling

RF power valves

A RANGE of three new RF power valves incorporate an improved means of water cooling, claimed to be more efficient and easier to maintain and install than the conventional water-jacket. These are types "15P12," "16P12" and "16P13," the first having an anode voltage rating of 6 kV, with a maximum dissipation of 0·6 kW and RF power output of 2·5 kW at 60 Mc/s. The latter two, differing only in cooling water coupling, each have an anode voltage rating of 8 kV, a maximum dissipation of 3 kW and an RF power output of 7·5 kW at 40 Mc/s. Cooling is by means of a spiral copper tube wound closely round the valve anode cap, through which water is circulated. Water capacity is about 1 litre for every 3 kW of anode dissipation and, because there are no seals, the risk of leakage is reduced. Water couplings available can be either for flexible tubing or of the union type. *AEI Radio and Electronic Components Division, 155, Charing Cross Rd, W.C.2.*

Fan/radiant fire with coal-effect

NEW in the "Masterpiece" range of coal- or log-effect fires is a model that incorporates a fan heater. Designed for building into an existing fireplace, the heater is constructed with the coal or logs above and behind a 1 kW element, which is mounted horizontally in a pewter grey or bronze surround with chrome trim.

The fan unit is situated behind the imitation coal where it forces air over a 2 kW black heat element and out through an aperture between the coal and the radiant element mounting. Control of these functions is separate. Price of the fire, "Rembrandt," is £24 18s 6d, coal; log-effect 14s 3d extra. *Gordon Miller Ltd., 91 Beddington La, Croydon, Surrey.*

New low-priced light fittings

AN entirely new range of low-priced domestic lighting fittings is to be announced shortly by Philips. Most items in this 64-piece selection fall within the £2 to £5 price bracket. Covering every type of domestic fitting—pendants, wall-brackets, standard lamps, hall lights, etc., the range is said to be designed with strictly contemporary tastes in mind. Further details will be available soon. *Philips Electrical, Century Hse, Shaftesbury Ave, W.C.2.*

Atlas price increases

WITH effect from 6 Feb. tungsten filament fittings in certain Atlas ranges will be subject to price increases of 7½%. Fittings affected are: industrial dispersive; elliptical and parabolic reflectors, local lighting reflector, high-bay lighting units, blended light fittings and industrial diffusers. *Atlas Lighting Ltd., Thorn Hse, W.C.2.*

Wandsworth revise prices

A NUMBER of price changes appear in the new accessories catalogue of Wandsworth Electrical. All items in the large "Wempress" range of rocker switches are reduced, the cheapest Group "A" single-gang model 6001, now selling at 9s 3d, and the largest Group "A" nine-gang, 7052, at 147s. Some increases occur in the industrial, shock-proof and sparkless assemblies, whilst "Ringway" and "Middlesex" switches and sockets are subject to a general price readjustment. *The Wandsworth Electrical Manufacturing Co., Albert Drive, Sheerwater, Woking, Surrey.*

Imported synthetic resins

IT is announced that dimethyl terephthalate resins, manufactured by Chemische Werke Witten, GmbH, are to be distributed in this country. The resins, of which three types will be available, form the basis of insulating varnishes and wire enamel. *Chemicals Trading Co. Ltd., Cree Hse, 18-20 Creechurch La, E.C.3.*

REMOTE CONTROL SWITCHES

ONE of the main factors influencing the reliability of control switches used in industry is, of course, environment. To overcome this problem Dowty Electrics have introduced a so-called "environment free" device known as the "Microseal Switch." As its name implies, this is a micro-switch having standard dimensions, but which has been thoroughly sealed against the ingress of moisture. In addition, it is said to be capable of operating under the most severe conditions over a temperature range of −75°C to 70°C. Glass-to-metal seals are interposed between the switch tray and terminal block, while the plunger mechanism has an "O" ring seal and associated nylon scraper ring. The switch action comprises a heavy-duty, double-pole changeover contact arrangement, a positive snap-action being ensured by soft-iron armature moving between permanent magnet poles. A feature of the design is that contact pressure increases until the moment of changeover, thus reducing arcing.

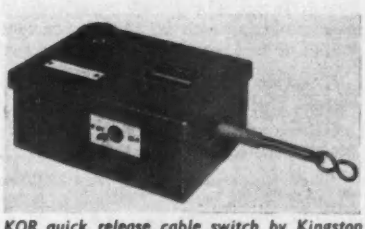
Keeping liquid levels within specified limits is a common requirement in chemical processing and, of course, steam raising plant. The "Model 26" is the latest addition to a range of liquid level alarm operating switches manufactured by AEI. These employ a patented flexible shaft in conjunction with a liquid displacer. The displacer is partially immersed in the liquid surface, any change in surface level changing the buoyancy. The effect actuates a micro-switch and is transmitted via a stiff tongue within the flexible shaft. The switch operates with a buoyancy change of about 6 oz, this being equivalent to level change of ½ in. for liquid having a specific gravity of unity.

Another automatically operated control switch on the market is for cutting-off power supplies to an electrical installation in the event of an outbreak of fire and the closing of an alarm circuit. The switch, working on the changeover principle, has two pairs of contacts, one pair, in series with the power circuit, being held closed by a wire-rope or cable under tension. The wire-rope incorporates a fusible link which will be melted by the heat of any fire breaking out, releasing the switch and thus opening the power circuit and closing the alarm circuit (in series with the second pair of contacts). This is the "KQR" quick-release cable switch manufactured by Kingston Control Systems. The unit, having dimensions of 4¼ in. by 2¼ in. by 2¼ in., has a manual cable-release push-button and can be supplied with a manual switch in series with the power circuit contacts, if required.

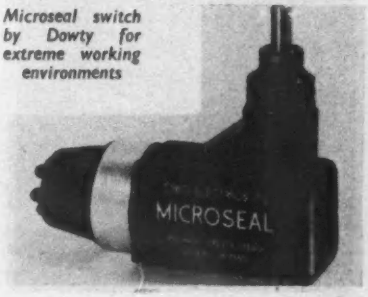
Dowty Electrics Ltd., Tewkesbury, Glos.

AEI, Instrumentation Division, Crown Hse, Aldwych, W.C.2.

Kingston Control Systems Ltd., Empire Chmbrs, Clarence St, Kingston-on-Thames.



KQR quick release cable switch by Kingston Control Systems Ltd.

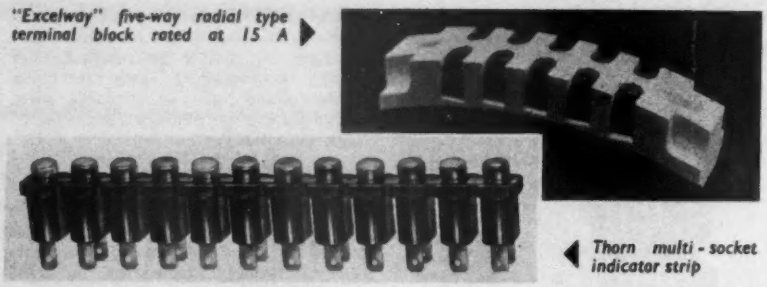


Microseal switch by Dowty for extreme working environments

Multi-socket indicator strip

FOR use with computers, control panels and similar equipment where visual indication is required, new multi-socket indicator lamp strip has recently been announced. This is available in either 6 in. or 9 in. lengths, each having 12 lamp sockets at ½ in. or ¼ in. centres, respectively. A single socket, similar to those making up the strips, is also available. Lamps rated at 6 V, 12 V and 28 V, having a life expectancy of 3,000 to 5,000 hours, can be supplied together with translucent plastics caps in white, red, yellow or green. *Thorn Electrical Industries Ltd., Upper St. Martin's La, W.C.2.*

"Excelway" five-way radial type terminal block rated at 15 A ▶



◀ *Thorn multi-socket indicator strip*

Radial type terminal block

PRODUCED by the French associates of "Metway Ltd.," the "Excelway" is a five-way radial type terminal block for mounting on curved surfaces. It is moulded in "Ervamine," a white plastics material said to be resistant to temperature extremes and effects of acids, oils and greases. The screw-type terminals have a maximum rating of 15 A. Minimum price is 1s 8d each in lots of 2,500.

Among British-made products of the same company are fused terminal blocks for individual protection of fluorescent tube circuits having either twin 80 W or single 125 W units. There is also the "Unitway" twin barrier type terminal block in black moulding, rated at 100 A, 650 V. These units are available in assemblies having up to 58 ways. *Metway Electrical Industries Ltd., Canning St, Kemp Town, Brighton 7.*

SWITCH FUSES AND ISOLATORS

FOR factory, building and commercial electrical installations, Dynamics Ltd., of Bristol, manufacture medium voltage switch-fuse units in the 30-800 A range. These incorporate h.r.c. fuses and are available in the double- or triple-pole and neutral variety. Housings are fabricated in heavy-gauge sheet steel, galvanised for use in industrially polluted atmospheres. The operating handle of each unit, embodying the usual safety interlock, is on the front door-panel enabling a number of units to be mounted alongside to make-up a composite, self-supporting control or distribution panel. Switch on/off positions are flag indicated. The same company also specialise in busbar chambers up to 600 A rating and custom-built control and distribution boards for individual requirements.

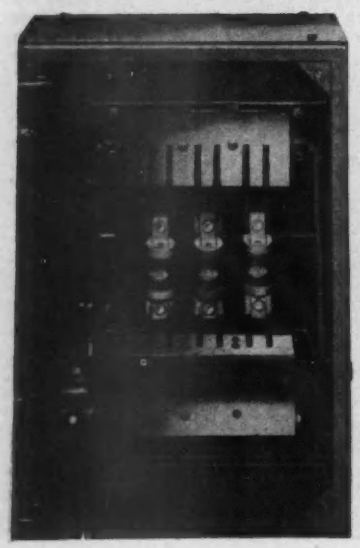
In the domestic field, George Scholes have added to their "Wylex" range with a combined switch-fuse assembly for installations which include both normal supplies and supplies at off-peak tariffs, such as for floor-warming and water heating. Housed in a metal case having dimensions 11¼ in. by 12¼ in. by 2⅞ in. and finished in grey hammer stove enamel, unit assemblies are available in various multiple fuseway combinations. Maximum number of fuseways in any switch bank is six. Another product in the "Wylex" range is a switched spur box for teeing-off fixed appliances from 13 A ring-main circuits. Fitted with an h.r.c. cartridge fuse, it is available in a brown or ivory moulding, with pilot light if required.

An improvement in the fault current rating of rocking-type rural isolating switches is announced by Line Equipment Ltd. This has been achieved by replacing the conventional tubular type moving contact blade by a "hairpin" pattern. The new blade is formed from ¼ in. dia copper rod and is said to give more positive mating with the fixed contact by virtue of its outward spring action. In addition, cooling is facilitated by the provision of two parallel current paths by the "hairpin." The combined effect of these design features has been to increase the three-second withstand current from the original 13·1 kA to 15 kA. The company also specialises in high-voltage fuses for rural distribution, both of the powder filled and expulsion type. A recent addition to their well-known range is a 33 kV powder-filled type complying with BS 2692 for current ratings up to 35 A.

Dynamics (Bristol) Ltd., 20 Cumberland St, Stoke Croft, Bristol 2.

George H. Scholes and Co. Ltd., Wylex Wks, Wythenshawe, Manchester 22.

Line Equipment Ltd., 71a Queen Victoria St, E.C.4.



◀ *Dynamics switch-fuse assembly in heavy-gauge sheet steel showing h.r.c. fuses*

Grouped miniature potentiometers

MINIATURE potentiometers in groups of either two or three are now available, housed in a single aluminium container little larger than a threepenny bit. Each potentiometer may be from 10 ohm to 125 kohm in value and 17 standard sizes cover this range. Operating range is −55°C to +150°C and dissipation at 50°C may be 2½ W. *Miniature Electronics Components Ltd., The Lye, St. John's, Woking, Surrey.*

Control gear prices up

AN increase in the prices of control gear from 30 Jan. by 6½% is announced by Contactor Switchgear. The company attributes the increases to higher material costs and recent wage awards. They will, however, accept orders for tenders outstanding for a certain period. *Contactor Switchgear Ltd., Moorfield Rd, Upper Villiers St, Wolverhampton.*

TRADE PUBLICATIONS

T.W.W.—17-page illustrated brochure devoted to the services offered by "Industrial Plant Department" of Thos. W. Ward, Albion Wks, Sheffield.

GLACIER.—16-page illustrated technical brochure describing bearing repair service. The Glacier Metal Co., Alperton, Wembley.

J.M.C.—Publication No. 1302, a 30-page brochure entitled "Electrical Contracts," intended to help designers of electrical and electronic equipment to select contact materials and determine optimum contact dimensions and operating force. Johnson, Matthey and Co., 73-83 Hatton Gdn, E.C.1.

STEEL.—A 55-page book properly bound and provided with a dust-jacket, entitled "This is United Steel." It gives a profusely illustrated account of the activities of the companies in ore mining, coal carbonisation, iron making, iron founding, steel making and shaping and in the manufacture of a wide range of products. Outline is given of research departments, personnel and works' services. The United Steel Companies, The Mount, Sheffield 10.

A.E.W.—16-page brochure illustrating a few standard ranges of electric furnaces and ovens. A.E.W. Ltd. (Incorporating Watmel Ltd.), Imperial Wks, High St, Edgware, Middx.

News of the Week

Rail Electrification To Go Ahead

London - Crewe - Manchester - Liverpool scheme Approved

THE electrification on the London-Midland British Railways' line to Crewe, Manchester and Liverpool is to go ahead. This announcement by the Minister of Transport to the House of Commons on Monday resolved uncertainty that had existed since the placing of contracts for the scheme was suspended last summer, because the Government felt they needed more information.

Work on the scheme is to be rephased to permit completion by 1966. The revised programme puts completion two years later than was originally proposed, and there are two main reasons for this. The first is that reconstruction of Euston station is now included in the scheme, which it was not formerly. The second factor is that planning is based on the assumption that work on the whole scheme can proceed at the optimum rate having regard to the resources available.

Government approval of the scheme, Mr Marples said, should not be taken as indicating that all electrification schemes scheduled for the future would be approved, but the decision demonstrated the Government's faith in rail modernisation and also in the British electrical manufacturing industry.

Mr Marples was speaking in a debate on the Government's proposals for reorganising the nationalised transport undertaking (ELECTRICAL TIMES, 29 Dec.). These proposed changes in the existing form of the BTC and the writing off of much of the present railways' debt. He said that the 1959 BTC reappraisal of rail modernisation schemes had never been endorsed by the Government so far as the financial estimates were concerned. That was why he had taken "crash action" by demanding to see all schemes involving more than £250,000 and suspending new contracts.

At present the Minister had before him detailed proposals of BTC for the next four years. Final decisions on these had not been taken. However, it had been agreed that in 1961 there would be £140 million of new investment by the railways.

The Government wanted modernisation but this work had to be carried out in a manner which was technically reliable, so that it gave reasonable return on investments and so that it accorded correct priorities to investments.

Technical reliability, Mr Marples said, was important not only from the public service viewpoint, but also from the aspect of promoting exports. "One or two things that have happened recently have not been to our advantage."

Further details of the present intentions on modernisation were given by Mr J. Hay, Joint Parliamentary Secretary to the Ministry of Transport. As a result of the examination of projects costing more than £250,000, over 70 had been approved. The go-ahead for the remainder of the London-Midland scheme would involve capital investment totalling £175 million.

Southern Tariffs Up

INCREASED tariffs announced by the Southern Electricity Board include a rise in the secondary rate of the domestic, farming and commercial and miscellaneous block tariffs from 1¼d to 1½d/unit. In the commercial and miscellaneous tariff, the primary assessment for lighting is being reduced and that for space-heating and lighting increased. There will also be a reduction in the primary units for lighting in the farming tariff.

It is estimated that under the increases most domestic consumers will pay nearly 10d/week more than at present. In addition, the m.d. tariff is being altered to complete the variations in tariffs aimed at providing a 10% increase in total revenue. They are effective from the first meter reading after 31 March next.

Rugeley Commissioned

THE new Rugeley power station of the Midlands Division, CEGB, went into full service last week when the first 120 MW C. A. Parsons turbo-alternator and 860 klb/hr Babcock and Wilcox boiler was commissioned. The initial installation is for two such sets, but the total is to be brought up to five.

Marking Foreign 'Fridges

IMPORTED domestic and commercial refrigerator cabinets, whether or not incorporating a refrigerating system or part of such system, may soon have to bear an indication of origin. The Board of Trade have been asked to recommend the making of an Order in Council to have this effect, and the application has been referred to the Standing Committee (General Merchandise). Representatives of any interests affected by the application should appeal by 17 March.

We reported on 16 June last the protest of Mr. N. F. T. Saunders, managing director of Kelvinator Ltd., that many imported refrigerators were being sold in the UK in a manner deliberately designed to convey the impression that they are British.

CONNECTION CHARGES—WARNING BY S.W.E.B.

WARNING has been given to local authorities and private estate builders in South Wales that unless they comply with installation standards, full connection charges will be imposed.

In future, the Board will make a connection charge of £30 per house where the conditions are not met, but where the wiring system meets the demanded standard this will be reduced to £15. Further reductions of £5 in each case will be given where the initial tenant is allowed his own choice of space heating, water heating and cooking.

Ceylon imposes 55% duty

CEYLON has increased its import duties for the second time in six months. The rate on domestic electric appliances from non-Commonwealth countries was raised last week from 30% to 55%. Britain has hitherto enjoyed a 10% preference and, while there are no guaranteed preferences from Ceylon, it is expected that the new rate to Britain will be 45%. A wide range of goods has been made subject to licensing restrictions.

NUCLEAR JOIN-UP

THE unification of interests of Atomic Power Constructions Ltd. and the GEC—Simon-Carves Atomic Energy Co. Ltd., which was held in abeyance during the discussions on a possible GEC—English Electric merger, are now going ahead. Under the title of United Power Co. (as we reported on 6 Oct.), the new concern has its headquarters at 28 Theobalds Rd, London, W.C.1. Chairman is Mr A. L. G. Lindley, with the Rt Hon Lord Coleraine as deputy chairman and Col. G. W. Raby, C.B.E., as managing director. Other members of the board are Messrs H. Clarke, J. Mayer, R. N. Millar, O. J. Philipson, C. C. Vinson and Dr K. J. Wootton, plus Dr H. K. Cameron and Mr J. W. Ashley as joint technical directors.

The United Power Co. Ltd., which is tendering for the proposed Oldbury nuclear station, has an equal partnership between Atomic Power Constructions Ltd. and the GEC—Simon-Carves Atomic Energy Co. Ltd., the former company comprising International Combustion (Holdings) Ltd., Richardsons Westgarth and Co. Ltd. and Fairey Engineering Co.

HOLME PIERREPONT INQUIRY ENDS

THE threat of an increase in the present high incidence of crippling illness from respiratory disease in the area, was stressed by several objectors to the proposed Holme Pierrepont power station, at the resumed public inquiry at Nottingham Shire Hall last week. The 14-day inquiry, probably the longest ever concerning a power station and estimated to have cost £1,000 a day, ended on Thursday. Dr J. D. Procter, president of the Nottingham branch of the British Medical Association, read a recent statement passed at that branch which declared that "because an increase in the atmospheric pollution is inevitable if the project is put into effect, the branch gives the fullest support to the view already expressed by the city's medical officer of health, that in no circumstances should a population of over 500,000 be exposed to a risk which is both unjustified and unnecessary."

Dr D. Davies, a consultant to the Mansfield Group of Hospitals, said he had come to the conclusion that the station would lead to a considerable increase in the frequency of chronic bronchitis in Nottingham and West Bridgford. In cross-examining Dr Davies, Mr S. B. R. Cooke, Q.C., for the CEGB, said that the dangerous elements in atmospheric pollution had not been identified and research was still going on to determine them.

The aim of medical research was to incriminate specific pollutants. Since none had been so incriminated there was a danger, he said, in making categorical statements about two particular pollutants, smoke and sulphur dioxide.

Dr Davies agreed with that statement but disagreed with the belief of some medical authorities that there is a greater correlation between the mortality rate and particulate matter than between the mortality rate and sulphur compounds.

Earlier, Mr D. M. Cowley, representing Bingham and West Bridgford Councils, alleged that the only evidence on air pollution by the CEGB was given by their chimney-emission expert, Mr Glyn England, "who was not medically qualified and who had no meteorological experience."

On the question of property values, Mr S. G. N. Mitchell estimated the total depreciation of property in the affected area, including Carlton and parts of Nottingham, at around £3½ million.

Solicitor to Nottingham County Council, Mr J. Brockbank, said that the Council genuinely welcomed the power station in the county, but not on the site suggested. To build the station at Holme Pierrepont would be an appalling planning blunder with far-reaching consequences. He also contended that the CEGB had failed to produce witnesses from the NCB or from British Railways to support their case.

If the Minister of Power decides to call in an independent expert to study the economics of the station, as was earlier suggested, objectors to the project will submit a nine-point questionnaire to him, it was revealed at the hearing.

The inquiry ended last Thursday. A decision will be announced at a later date.

Consultative Councils —Co-op Party's View

OPERATIONS of the consumer councils and consultative committees in the nationalised industries are very weak safeguards in monopoly conditions, in the opinion of the Co-operative Party given in a policy statement published last Friday. They consider that much better provision should be made to strengthen the consumers' influence and feel that the industrial consumer is better protected because he is more organised.

Responsibility for consumer machinery must be removed from the boards and, at the same time, the Board of Trade, or a special Government department established for consumer protection, should be made responsible for the operation of these bodies, they urge.

This would be better for the consumer interest and would accord with the principle that the boards should not be saddled with financial obligations they do not control, it is contended.

Rise For Scottish Electricians

Increases in pay for journeymen electricians in the contracting industry in Scotland have been agreed between the E.T.U. and the E.C.A. of Scotland. The hourly rate for journeymen is increased by 8d to 5s 10d in March, and by a further 4d to 6s 2d in Jan., 1962. From March there will be increases in the percentage rates for apprentices —on the new rates. Existing agreements on overtime, site conditions, etc., are to remain in operation, but from March there will be an increase in the outworking allowance from 9s 6d to 10s a day.

OFFICIAL PUBLICATIONS

Fuel Research 1917-58. Review of work of Fuel Research Organisation of DSIR. HMSO. 15s.

Test and Certification of Intrinsically Safe Electrical Apparatus and Circuits. Testing Memorandum No. 10. HMSO. 1s (see page 187).

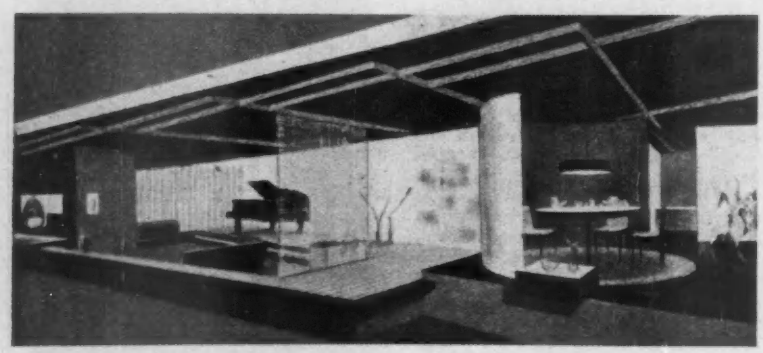
National Research Development Corpn. Report for 1959-60. HMSO. 1s 6d (see page 172).

Social Ownership and Control. Co-operative Party Policy Statement. 1s 3d (see this page).

NCB Specification 232: Dimensions of Edison-type screw lamp caps and lampholders; 233: 13 A two-pole and earthing-pin fused plug and shuttered-socket outlets, for up to 250 V a.c.; 239: Bayonet lamp caps and lampholders for up to 250 V (6d each). Amendment slips: P139. Rubber insulated armoured cables for power, lighting and control; 202. wire-armoured paper-insulated cables for power supplies.

Acquisition

THE Birmingham electrical and radio wholesalers and distributors, E. and H. P. Smith Ltd., have agreed to acquire the entire issued capital of Chaphone Engineering Developments Ltd. Cost of the takeover is £20,000 cash plus 200,000 shares of 2s each in Smith's. In addition, further allotments of up to 300,000 such shares may be made dependent upon profits achieved by Chaphone.



Visitors to the Furniture Exhibition at Earls Court will find an unusually exciting display on the "Home" magazine stand. Atlas Lighting Ltd. have applied their "Aurama" system, developed for the Son et Lumiere displays, to an automatic demonstration of atmosphere lighting in a modern living/dining room with dramatic effect. In a cycle lasting some six minutes, seven basic scenes and 40 different lighting effects are presented to an accompaniment of music and commentary, both lighting changes and accompaniment being controlled by tape. At the end of each cycle, the tape-deck is reversed and returns to the beginning at double speed to music recorded on the opposite track. Lighting, from some 170 spots, lamps and tubes, therefore provides a fascinating choice of treatments in colour from which the home lover will find new ideas for his or her own surroundings. The setting was designed by Messrs Tandy, Halford and Mills.

Clearing way for Consumer Safety Regulations

REGULATIONS governing safety features in consumer goods may be made by the Government under the proposals of the Consumer Protection Bill which received a second reading in the House of Commons last week. The Bill is a private member's measure but, on behalf of the Government, Mr D. Renton, Under Secretary of State, Home Office, announced acceptance of its proposals.

The Bill is based closely on proposals in the interim report of the Molony committee on consumer protection. The sort of regulations envisaged are those already in operation for fire guards on electric fires and for construction of oil heaters, which have been made under individual Acts. In announcing Government acceptance of the Bill, Mr Renton paid tribute to the "generally speaking vigilant and careful attitude of manufacturers" to safety factors in their products. He did not expect that need to use powers given by the Bill would arise very frequently; only when there was a clear lack of safety should there be a regulation.

In a lengthy debate on the Bill, mainly enthusiastic for its proposals, much was heard about electrical equipment. Dangers of do-it-yourself electrical wiring were mentioned and, following the comments of the Molony committee, electric blankets were discussed. Several speakers referred to difficulties arising in connection with plugs, and Mr J. Wells, MP for Maidstone, commented on the frustration many people still felt about non-standardisation of plugs. In particular, he was unhappy about varying arrangements within 13 amp plugs for positioning the fuse. The member for Stoke-on-Trent North, Mrs H. Slater, suggested that there was still not available a plug and socket really safe where children were concerned.

"Switch selling" of electrical appliances received the attention of Mr J. Stonehouse in the debate. He alleged that some of the former directors of Vactric, which he said used switch selling in its subsidiary Nortic, were now directors of Electromode, of Manchester, which the Retail Trading Standards' Association said was using switch-selling techniques.

Mr F. Noel-Baker attacked a body called the British Safety Council, which some people thought had been trading on the gullibility of the public and issuing so-called safety seals for articles which had never been effectively tested.

A criticism of the Bill advanced by some members was that its possible range of application was excessively wide because "consumer goods" was nowhere defined. It seems possible that the Bill may have a difficult passage in its committee stage, which must be completed in the next few months if it is to reach the Statute Book.

FINDING YOUR M.P.

SHOULD MP's be provided with personal-call equipment while they are in the House of Commons? Last week, Mr A. Lewis, M.P., pressed the Minister of Works to arrange for MP's "to have the benefit of the personal call system as in operation at many of the large London offices and hospitals." These systems commonly operate on an inductive loop principle, giving an audio or visual signal to the person sought by means of a small pocket receiver.

The Minister of Works said he was keeping the position under review, but he was not satisfied that MP's generally desired the facility (at present, if they are wanted, messengers have to seek them out). He did not answer a request that he should arrange an exhibition of the system at the House of Commons.

IRAQ MISSION

MR H. G. NELSON, managing director of English Electric, is head of a small party of British businessmen which left London by air on 1 Feb. for Baghdad to examine the prospects of increasing trade with Iraq. The mission which will return to London on 10 Feb., has been jointly organised by the Advisory Council on Middle East Trade.

Electric Heating for Gas Holders

SOUTH Eastern Gas Board are having electrical heating systems installed on a large number of gas holders to prevent the water seals from freezing in frosty weather. Malcolm and Allan, of the Metal Industries Group, have already installed the system, to the design and specifications of the Gas Board, on the gas holder at the Oval and will put in others. The m.i.c.s. heating cables are automatically controlled by thermostat.

L.D. sell know-how to U.S.

LANCASHIRE Dynamo Electronic Products Ltd. have concluded a licence agreement with the Emerson Electric Manufacturing Co., St. Louis, Missouri, under which the latter concern have the right to manufacture in the US on a royalty basis the complete range of industrial electronic control equipment developed by the British company.

The agreement also provides for a reciprocal flow of information in respect of advances in the design of the equipment covered by the licence.

ANOTHER MERSEY TUNNEL?

AN electric railway or tramway to run from end to end through the lower part of a new tunnel alongside the existing Mersey tunnel is included in recommendations just made by engineering and traffic consultants as an answer to the cross-Mersey traffic problem. They estimate that the new tunnel will be needed before the mid-1970's even if a new bridge linking Liverpool and Birkenhead is built, as they suggest. The report, by Mott, Hay and Anderson, consulting engineers, and W. S. Atkins and Partners, traffic engineering specialists, puts the total cost at some £50 million. The report is to be considered by the joint committee of Merseyside local authorities and the Mersey Docks and Harbour Board on 16 Feb.

More orders—exports bright

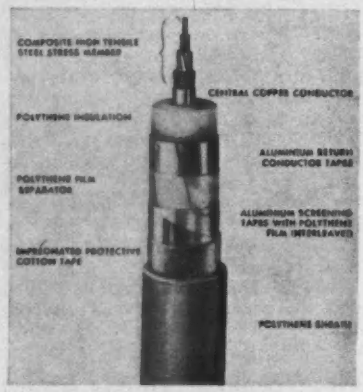
A SHARP rise in new orders during November left the industries producing engineering and electrical goods with longer order books at the end of the month than at any time for the past two years. Home and export orders were both about 16% higher than a year earlier. The export position in November was particularly strong, when 13% more new orders were received than in October, against a rise of 5% for home orders. Production, which has been tailing off each month from April's high level, took a sharper downturn in November.

Large Control Board for Russia

This 61 ft long control board is the largest of its kind shipped from the AEI Rugby works. With a 13 ft laminated plastic mimic control diagram at its centre—fully coloured to indicate the various flow paths—it is one of fifteen being supplied by AEI to Simon Handling Engineers Ltd. a member of the Rustyfa consortium, for a Russian tyre factory.

TRANS-PACIFIC TELEPHONE LINK

UP to 80 simultaneous two-way telephone conversations will be possible over the proposed "COMPAC" submarine cable, whose contract award was reported in last week's ELECTRICAL TIMES. The cable, which is to be supplied jointly by Submarine Cables Ltd. and Standard Telephones and Cables, will link Australia to Canada via New Zealand. It is of a lightweight, unarmoured coaxial type, suitable for laying at depths of up to 3,500 fathoms, mechanical strength being provided by central strand of high-tensile steel. This form of construction eliminates torsion effects under tension and, combined with the lightness of the cable, minimises the risk of damage to the submarine repeaters during laying operations. Repeaters are connected at 26-mile intervals. A copper sheath round the central steel core forms the inner conductor of the



A section of the cable

cable, the outer concentric conductor being of aluminium tape lapped round polythene insulation. Then follows a layer of polythene binding tape, and a single tape aluminium screen lapped with anti-corrosive tape. Final diameter of the cable, which is sheathed overall with polythene, is about 1·3 in.

Each of the submerged repeaters, housed in 10 ft long by 10½ in. dia. steel tube, is capable of withstanding a hydrostatic pressure of 5-6 ton/sq in. Inside is an amplifier, filters, equaliser and supervisory apparatus, comprising over 300 components built-up in eight units contained in a hermetically sealed brass tube. Thermionic valves are used in the amplifiers powered by a d.c. supply fed via the inner conductor of the cable using the sea as a return path. Assembly of all repeater components is carried out with extreme care to ensure continuous operation on the sea-bed for at least 20 years without maintenance.

S.W.E.B. orders third 3 MW power station

PIONEERS in the use of small unmanned power stations for peak load, South Western EB are to establish a third 3 MW set—this time at Porlock, Somerset. The turbo generator has already been ordered from Bristol Siddeley. The first of these sets in the U.K. was inaugurated by SWEB at Princetown in December, 1959, and another has since been put into service at Lynton. Like its predecessors, the Porlock set will be controlled by telephone dial from Bristol, coming on load in about 2½ minutes from standstill and synchronising with the supply system automatically.

Prime mover of the sets is a modified version of Bristol Siddeley's Proteus gas-turbine aero engine. This gives 4,250 h.p. and the generating set is capable of supplying a town of 10,000 people in an emergency.

Telephone Progress

PLANS for development of the telephone system were described by the Postmaster General last week, when the House of Commons gave a second reading to the Post Office Bill. This is designed to increase the department's commercial freedom of action.

Last year about 450,000 new telephones were put in by the Post Office, 13% more than in the previous year. It is hoped that the 900 remaining local manual exchanges will be automatic by 1970. By March next, there will be 250,000 subscribers connected to 69 exchanges using the subscriber trunk dialling system and, during 1961, changeover to subscriber trunk dialling will be carried out at a rate of five exchanges a week. March, 1962, should see about 1½ million extra subscribers provided with STD facilities.

Dowty/Boulton & Paul Merger

TERMS have been agreed for the merger of the Dowty Group and Boulton and Paul Aircraft Ltd. For all the 2,000,000 issued 5s Ordinary stock units of Boulton and Paul, the former concern are offering 8s cash and one 10s Dowty Ordinary share for every two 5s B and P. The latter have expanded into electronic engineering from its aircraft work, while Dowty make a wide range of aircraft components.

SWITCHGEAR FOR STEELWORKS

A CONTRACT has been awarded to A. Reyrolle and Co. by Richard Thomas and Baldwins Ltd. for all the 33 kV and 11 kV switchgear and for 3·3 kV switchgear associated with the iron-ore processing section of the works to be installed in their new Spencer Steel Works being erected at Llanwern. Four 275/33 kV 75 MVA transformers will be installed to feed through four 33 kV single-busbar metalclad switchboards complete with cubicle-type control and relay boards. This 33 kV switchgear will consist, in all, of 38 1,200 A panels with vertically isolated oil-break circuit-breakers and six 2,000 A panels of similar design for the incoming transformer supplies and busbar-section panels. Two of these boards will be in the works main substation, a third will be in the hot mill substation and the other in cold mill substation.

The four 33 kV boards will feed the 11 kV primary distribution through 15/21 MVA transformers and Reyrolle are providing 17 11 kV switchboards, totalling 191 panels. The Power House board will comprise 17 500 MVA duplicate busbar metal-enclosed air-break switch panels, two of which will control 10 MW alternators with provision for a further two in the future. The whole of the 11 kV system will be remotely controlled from the works main substation, which will also house a central alarms desk.

At a presentation ceremony in London, the top three national prizewinners in the Morphy-Richards Window Dressing Competition received their cheques and award plaques from TV personality, Michael Miles. In the group are (left to right): Mr K. Mallett (display manager) and Mr G. R. Cooper (managing director) of G. R. Cooper (Oxford) Ltd.—first prizewinner (£500); Mr Michael Miles; Mr V. J. Snelling (display manager) of Spooner and Co. Ltd., Plymouth—second prizewinner (£250); Mr W. R. Roxburgh, managing director of Morphy-Richards Ltd.; Mr H. W. Griffiths, director and general manager of Morphy-Richards (Cray) Ltd.; Mr G. A. Collins (window dresser) Northampton Co-operative Society—third prizewinner (£100); and Mr R. M. Morgan, sales director of Morphy-Richards (Cray) Ltd.

Deptford in January!—South Sea island girls testify to the warmth of LEB's newly modernised and enlarged showroom at the opening last week. The showroom is heated by 12 of GEC's 2¼ kW "Nightstor" block storage heaters, and there is cable heating under the pavement outside

Export Council starts fact-finding drive

SIR WILLIAM McFADZEAN will lead a mission to Spain from 12 to 18 Feb. as part of a major fact-finding campaign by the Export Council for Europe. Sir William is chairman of the newly formed Council, as well as chairman and managing director of BICC. Sir Kenneth Preston, chairman of Stone-Platt Industries, and Mr C. R. Wheeler, vice-chairman of AEI, will also be among the 13 delegates. During February, other missions will visit Switzerland, Sweden, Austria, Portugal, Denmark, Italy, Norway and France. A further ten missions will go to other European countries during May and June.

Large Orders

THE Engineering Division of the Telegraph Construction and Maintenance Co. Ltd. have received a contract from Wartsila-Koncernen A/B, of Finland, for all the cable handling equipment for two new 7,000 ton cableships they are building for the USSR.

Cable and Wireless Ltd. have ordered a new 8,000-ton diesel-electric cable laying ship from Cammell Laird and Co., of Birkenhead. Electric propulsion machines and diesel engines are to be supplied by the English Electric Co. Ltd., and the forward cable gear by Johnson and Phillips Ltd.

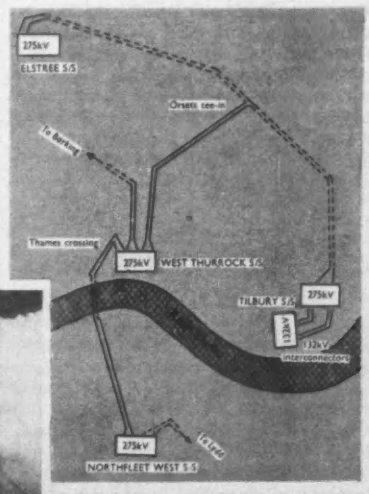
The London Electricity Board have ordered 240 500 kVA distribution transformers worth over £200,000 from Associated Electrical Industries Ltd. The latter are also to supply h.v. tap changers for voltage regulation on transformers at each end of the Monk Fryston-High Marnham 400 kV line.

275 kV lines from West Thurrock near completion

THE commissioning of West Thurrock power station later this year is allowed for in extensions to the transmission system now nearing completion in the vicinity of Tilbury. From West Thurrock the new lines run north east to the existing Tilbury to Elstree line and south across the Thames to Northfleet. Stringing of the Thames crossing is not now expected to take place until the spring, having missed this winter's load. The extensions are designed to tie-in with the future link between the power systems of Britain and France. Later, a 275 kV line will be taken from Northfleet to Lydd, which will be the terminal for the cross-Channel cable and will also transmit power from the nuclear station under construction at Dungeness.

With the exception of the Thames crossing, the current extensions are being carried out by AEI Construction (Cables and Lines) Division under a £400,000 contract (BICC, who are handling the Thames crossing, have completed the two 615 ft towers—see the ELECTRICAL TIMES, 5 Jan.). AEI's contract includes the erection of 8½ miles of 275 kV line, ½ mile of 132 kV line and the construction of 16 terminal towers at substations.

A special junction tower, Blaw Knox type DJX, was built at Orsett to tee-in the new 275 kV line from West Thurrock to the west circuit of the existing Tilbury to Elstree line. Transfer of the east circuit to the junction tower and the dismantling of a temporary ST tower which at present carries this circuit will be completed later this year. A spur has been constructed north west out of West Thurrock substation to take a future line to Barking. Another line bends south from the substation to the Thames and on to the new Northfleet West substation.



Top right: The solid lines show the work covered by AEI's contract

Right: The 275 kV double-circuit line at the crossing of the Southend arterial road on the route to the tee-in with the Elstree-Tilbury line at Orsett, five miles north of Tilbury

Testing intrinsically safe equipment

PROCEDURE for obtaining Ministry of Power certification for intrinsically safe electrical equipment is set out in a revision of the Ministry of Power's Testing Memorandum No. 10, published last week. The main change from the previous (1953) edition of the memorandum is an extension in the number of flammable gases and vapours covered by certificates and an increase in fees for testing.

The gases for use in which apparatus can be certified "intrinsically safe" are split into four groups, each with a representative gas as the basis of certification. The breakdown is as follows:

(a) Certification with respect to methane (firedamp) will be based on tests in a mixture of methane and air containing about 8·3% by volume of methane.

(b) Certification with respect to butane (calor gas), pentane, hexane, iso-hexane, heptane, benzene, petroleum vapours, cyclohexane, cyclohexene, acetone, carbon monoxide, methyl acetate, acetaldehyde, and methane (non-mining use) will be based on tests in a mixture of pentane vapour and air containing about 3·9% by volume of pentane vapour.

(c) Certification with respect of ethylene and buta-1:3-diene, ethylene oxide will be based on tests in a mixture of ethylene and air containing about 7·8% by volume of ethylene.

(d) Certification with respect to hydrogen, coal gas (town's gas), coke-oven gas, blue water gas and carbon disulphide will be based on tests in a mixture of hydrogen and air containing about 21% by volume of hydrogen.

TOWARDS BETTER OFFICE LIGHTING

GOOD office lighting means good business, not only in terms of improved efficiency but also of increased lighting sales. This is the theme of the Office Lighting Exhibition arranged by the British Lighting Council at Lancaster Pl, W.C.2. The exhibition formed the focal point of a series of three conferences on the modern concept of artifical lighting as applied to office buildings and heralds new office lighting regulations, expected to come into force in January, 1962. The exhibits include mock-ups of office premises under various intensities of illumination, and contrast recommended standards of lighting with those commonly found in practice. Thus, according to a survey carried out in 1948, the average standard of illumination in UK offices was found to be 8 lumens/sq ft. By comparison the recommended standard is 20 lumens/sq ft and is to be increased shortly to a minimum of 30 lumens/sq ft, with figures of 50 and 70 lumens/sq ft in mind for the future.

"English as she is spoke..."

...should also be how she is wrote" was the theme of a severe but witty attack on the "pompous polysyllaby" and grandiloquent language used in some commercial and technical writings. The attack was delivered by Mr G. E. Walker, secretary of AEI Ltd., at the Batti Wallah's luncheon last week. The next luncheon, given to Captain Lister of the PLA, will be held on 22 Feb.

Power Statistics for Dec.

WE regret an error in Power Supply statistics for December in ELECTRICAL TIMES, 26 Jan., 1961, page 147. The 1,400 klb/hr boiler at High Marnham was built by International Combustion and not Foster Wheeler as stated. Foster Wheeler supplied the 860 klb/hr boilers for Drakelow "B" and Northfleet.

Sayings OF THE WEEK

"It's been a long hearing, but then it's rather a large power station." . . . MR H. W. GRIMMITT, chief engineering inspector, Ministry of Power, at conclusion of public inquiry in Holme Pierrepont power station proposals.

"Never was there a time when it was more vital to the welfare of this country that scientific skills should be steered to commercial channels . . . the wit of our brilliant research scientists is of no value to the nation if it is not quickly turned to industrial use." . . . SIR WILLIAM BLACK, NRDC chairman.

"With freedom of choice there is no doubt the majority of the public have chosen electricity for space heating because of the ease of installation." . . . MR G. LE B. DIAMOND, chairman, West Midlands Gas Board.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, January 31

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	219½	−½
" (3 months)	220½	+¼
LEAD, refined pig, 99·97% purity (cash)	64½	+⅛
" (3 months)	65¼	+⅛
TIN, refined, min. 99·75% purity (settlement)	784	+3
" (3 months)	787½	+2½
ALUMINIUM, ingots 99·99·5% ...	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	192½	−3½
SILVER (Troy oz)	79⅛d	+⅛d

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	79½	+1½
" (3 months)...	79½	+1⅛
RUBBER, per lb No. 1, RSS, spot	23½d	−⅛d
c.i.f. basis, ports, April ...	23⅛d	−⅛d
ARMOURING: Galv. Steel Wire (0·104 in.) ...	68	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	69	—
AMERICAN PRICES: Copper, electrolytic (per lb) ...	29c	—
Lead, (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

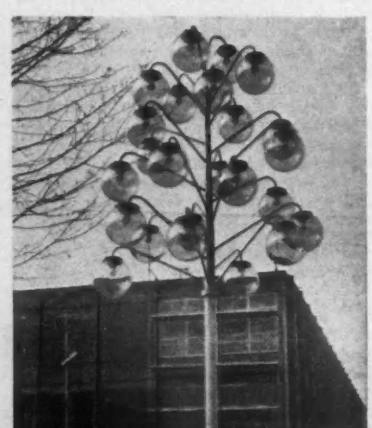
Favourable Future for 'Fridges

REFRIGERATOR dealers should closely watch their stocks in coming months, that is the warning from manufacturers. The half-million excess stocks have largely disappeared and, if ordering is left too late, the refrigerators may not be available when the selling season is in full swing. These views were expressed at a meeting with DoRDeC reviewing the past year.

This organisation is continuing its promotional work on refrigerators and considers that despite the so-called recession, the past year has been a good one.

Refrigerator production has been running at about the one million a year mark and, with only 25% saturation, the prospects are good; replacement sales are about 20% of the total. During 1960 there was an increase of 43% in exports over 1959. A comparison was made with the German market where production amounts to about two million a year, with 75% selling in their home market.

During the past year DoRDeC had made representations to the Government asking for some reduction in the initial deposit permissible with h.p. The extension of repayment to three years will not be so helpful, but with 20% more sales outlets now available, manufacturers are looking for a reasonably good year. Their one wish is for better sales and stocks information from the trade so as to facilitate production planning.



A new "tree" for Stuttgart's central gardens—venue for the city's horticultural show. A street lamp design that seems destined to grow

News in Brief

The Prime Minister is likely to be guest of honour at the BEAMA Golden Jubilee dinner at Grosvenor Hse on 31 Oct.

The North Western Electricity Board are offering four electric cookers as prizes in a competition open to persons who have ordered a cooker.

Blackpool Electrical Services Committee have approved an estimate of £94,500 for the cost of this year's autumn illuminations, which will be on from 8 Sept. to 29 Oct.

There is to be a debate in the House of Commons tomorrow on the Government's power policy.

The formation of an Institute of Corrosion was suggested by Mr C. L. Wilson of Liquid Metal Applicators Ltd. at the annual dinner of the British Association of Corrosion Engineers last week.

Title of the paper to be given by Dr A. E. Grauer at the BEPC on 14 June will be "The Electrical Power Industry in Canada."

Ferranti's computer department has opened an office in Melbourne to consolidate existing representation. A Sirius computer, the transistorised desk-size model, will be sent out for demonstration purposes in the near future.

Two new colour films, entitled "Dounreay Symposium" and "Steel for Nuclear Power," have been prepared by the UKAEA.

Company Activities

A SMALL flood of financial news from the electrical companies washed into last week's stock markets, yet despite the depressing nature of most of it, electrical share prices on the whole seemed to have been very little dampened. One of the chief items of news eagerly awaited by the City was, of course, the GEC interim. New chairman Mr Arnold Lindley made it a same again 3%, but his accompanying statement indicates that the provisional results for the first eight months' trading (i.e., up to the end of November, 1960) and the estimated figures for the remainder of the current year will be somewhat lower than last year. This, says Mr Lindley, is mainly due to the reduced trading in radio and domestic equipment groups although trading in other groups has been maintained. Before the dividend announcement the shares had shed 9d to 31s, but its publication saw the shares actually higher over the week at 31s 10½d.

Not so, however, with the new Pye-E. K. Cole merger group, British Electronic Industries, whose chairman, Mr Charles Stanley, had to report that the impact of hire-purchase and credit restrictions is most seriously affecting their current trading situation. And despite his rider that the position is well in hand to maintain and expand both companies' business from 31 March, 1961, the 5s Ordinary shares of BEI eased back over the week from 14s to 12s 3d.

One would have thought in the circumstances that Thorn Electrical, with its radio and TV interests, which come in the form of the British Radio Corporation, jointly owned with EMI, might, too, have suffered a setback. In the event, however, the shares, which started out the week at 46s 9d, rose to 47s 3d, dipped at one time to 45s 3d and finished the week and the Stock Exchange Account back at 46s 6d. EMI, on the other hand, was not so lucky, and chairman Sir Joseph Lockwood saw his 10s Ordinary shares stand 1s 3d cheaper at 43s 3d.

More shivers from the refrigeration industry were duly supplied by L. Sterne, whose group profits before tax for the year ended 31 Oct., 1960, were back to £599,256 from £703,248 in the previous year. The final payment to shareholders of 12½% as forecast, to make the year's total up to 20%, compares with the previous equivalent payment of 16¼%. Chairman Mr P. Brown, for that matter, had also indicated as far back as last September that profits would be lower, but last week's actual announcement did not prevent dealers knocking 2s 3d off each share to leave them standing at 22s 9d. Marco Refrigerators also slipped back to 4s 9d, despite chairman Mr. Batt's latest assurance, following the conversion of a trading profit into a loss, that an improvement can be looked forward to.

Perhaps the greatest disappointment of the week came from Venner, the electro-mechanical engineers, whose parking meters now stand sentinel in so many foreign as well as UK cities. For the year ended 31 July, 1960, the after tax profit of £56,529 is comparatively smaller than £37,247 for the previous seven-month period. There was also news of a cash-raising one-for-three "rights" issue, details of which will go out on 28 Feb. The combined effect of these news items was to topple the shares by 6s 6d a time to 16s 6d before a subsequent rally took them back to 19s.

Brightest spots of the week were provided by International Computers and Tabulators and by Granada. ICT, which has just secured another £200,000 computer order, this time from South African Railways, saw its shares jump from 70s 6d to 73s 9d, while Granada's "A" at one point spurted 4s apiece to 148s 9d.—*From our City Correspondent.*

Burco Dean Ltd.

Although Mr D. K. Ward, the chairman, reports that the affairs of the company are in a healthy state ready to take every advantage of any turn in the tide of trade, the year ended 30 Sept. last saw a very heavy strain on the liquid resources following the big reduction in demand for major appliances. He points out that supplies of raw materials ordered long before the event continued to be delivered to the works when the output at Burco was severely cut. Recourse was made to bank loans to meet this increased stock and money owing from customers and, subsequently, £450,000 unsecured loan stock was issued to put the position right.

General Electric Co. Ltd.

With a maintained interim dividend of 3% for the year to 31 March next, the board states that the provisional results for the first eight months' trading and an estimate for the remainder of the year indicate that the profit for the year will be somewhat lower than 1959-60, mainly due to reduced trading in the Radio and Domestic Equipment groups. Trading in other groups has been maintained.

M. Mole and Son

For the year to 31 Dec. last the net profit is £44,332 (*£43,886*) after taxation charge of £33,206 (*£29,414*). Dividend is again 11¼%.

Pyrotenax Ltd.

In this, the company's silver jubilee year, an interim dividend of 15% is repeated and it is hoped to at least maintain for the period ending 31 March the same cash dividend as for 1959-60 (40%). In the first half of the current year, product sales of the parent concern showed a satisfactory increase over the corresponding period of last year. With the exception of the Canadian subsidiary which did not achieve its planned output because of less favourable trading conditions, each group operating company has reported increased returns over the first half of the year. Despite the certainty of intensified competition in the m.i.c.c. cable field in the future, the directors are satisfied that plans already formulated to increase efficiency and scope should be to the ultimate advantage of all members of the group.

L. Sterne and Co. Ltd.

The setback to the refrigerator industry is reflected in this concern's group profit for the year ended 31 Oct. last. The total dropped to £599,256 from the previous year's £703,248. Taxation charge is £284,417 (*£345,882*) leaving a net profit of £314,839 (*£357,366*). A final dividend of 12½% makes the total 20%, compared with the previous year's equivalent of 16¼% after allowing for the one-for-one scrip issue.

Venner Ltd.

In addition to a 13% dividend for the year to 31 July last (representing a 1% rise), the directors announce a one-for-three rights issue, terms of which will be released on 28 Feb. Profit for the year at £112,070 is almost double that of the previous period of seven months. Tax charge is £55,541 (*£26,413*), leaving a net profit of £56,529 (*£37,247*). The chairman points out that since the scrip issue in August, 1959, the trading results obtained and anticipated are such that in order to continue with the expansion programme outlined, the rights issue has been recommended. Before the issue can be made it is necessary to increase the authorised capital from £380,000 to £550,000 by the creation of 680,000 Ordinary 5s shares. The necessary extraordinary meeting will follow the annual meeting on 28 Feb.

Westinghouse Brake and Signal Co.

Reduced delivery schedules for vacuum braking equipment was partly responsible for the reduction in profits for the past year, Mr A. R. S. Nutting, the chairman, reports. But he also warns that group profits for the current year may be a little lower still, due to the present market conditions and the effect of initial stages of manufacture of new products. In the latter category, the plan for quantity production of the Hobbs automatic gearbox will involve heavy capital expenditure.

Dividends Declared

Electronics Rentals and General Holdings. Interim 10% (*5%*) and proposed one-for-six rights issue.

Permali. Interim 4% (*3%*).

OVERSEAS NEWS

from our correspondents abroad

CANADA

Grand Rapids Generator Contract

A contract valued at nearly $3 million, for three hydro-electric generators has been placed with the English Electric division of John Inglis by the Manitoba Hydro-Electric Board. The turbines are for the Grand Rapids project on the Saskatchewan River where it flows into Lake Winnipeg. The Kaplan turbines will be built at the company's Toronto factory and will be delivered in late 1962. The Grand Rapids project is scheduled for commissioning in 1964. The contract was awarded against strong Canadian and international competition.

Power Plant Expansion

A $7¼ million generating expansion programme is scheduled by Canadian Utilities. The plans include a $4·4 million extension to the company's Battle River plant involving the installation of a second 32 MW generator for which the contracts have been placed with Brown Boveri (Canada). At the company's Vermilion plant an existing 17·5 MW gas turbine is to be replaced by a 30 MW Westinghouse unit. This scheme, estimated to cost $2·8 million, is scheduled for completion towards the end of the year.

Hamilton Falls Hydro Scheme

A daring programme to harness the Hamilton Falls, in Labrador, was referred to recently by the Newfoundland Premier. The proposal is to divert the Hamilton River from its present course through a canal to a hydro station. This scheme has two advantages, the head could be increased from 350 ft to 1,000 ft and it would be possible to build the generating plant on a more accessible site. Potential of the falls is estimated at nearly 10 million h.p. and the cost might exceed $2,000 million.

NS Takes Over Canada Electric

Last month the third largest privately owned power utility in Nova Scotia, the Canada Electric Co., was bought by the Province. The thermal generating plant operated by the company at Maccan will be integrated with the State's power system and the system will be operated by the Nova Scotia Power Commission. Price paid for the company was $1·6 million.

Codroy Valley Electrification

Proposed extension of electric power to Codroy Valley in Newfoundland would be likely to result in development of new industries worth $2 million per year, said the Hon W. J. Keough, Minister of Mines, recently. Expansion of agricultural and the poultry industries in the valley is at present severely hampered by lack of electricity.

Progress on S. Saskatchewan Dam

Following the recent completion of a $3 million contract for embankment work on the east side of the South Saskatchewan River, forming part of the vast $192 million irrigation and power scheme, plans are going ahead for more large contracts. These contracts which include embankment work, work on the diversion tunnels and aggregate processing and filter materials are expected to be submitted for tender shortly.

Beechwood Project in Spring

The 45 MW Beechwood hydro-electric development of the New Brunswick Electric Power Commission is scheduled to begin in early spring. The turbine is being manufactured by Canadian Allis-Chalmers and the generator by Canadian Westinghouse. Scheduled for commissioning in March, 1962, the new set will supplement power generation by two existing sets at the station.

Twin Falls Contracts Award

The Twin Falls Power Corporation have awarded a contract for power development at Twin Falls on the Unknown River to Dufresne Eng., who were the lowest bidders. Initial capacity of the station has been put at 120,000 h.p. and the estimated cost at about $30 million. Work is expected to begin this month and the first unit is to be completed by June, 1962. A 110-mile transmission line is already under construction by Canadian Hoosier Eng. The plans for Twin Falls include a diversion dam and power house with two hydro generators.

TRINIDAD & TOBAGO

Electricity Bill's First Reading

Two Bills affecting the supply industry in Trinidad have been given their first reading by the Legislature. The first concerns implementation of the Trinidad Government's decision to unify electricity supply in the island. The draft Bill provides for the takeover by the Trinidad and Tobago Electricity Commission of the Port of Spain and San Fernando undertakings. The second Bill provides for raising a loan from the International Bank for the reconstruction and development of electricity supply in the islands.

CYPRUS

Electrification Plan

The British Government is likely to be approached by the Government of Cyprus for a loan, said to be between £2 million and £3 million, for the first stage of a development scheme to bring electricity to all villages in the island. The expansion scheme is expected to cost about £11 million spread over six years and includes extensions to Dhekelia generating station and later the construction of a new station and enlargement of the island's grid system.

TURKEY

Power Station Necessary

The Izmir Electricity Corporation is reported to be trying to persuade the Turkish Central Government to reverse their decision not to permit construction of a power station. The Corporation maintains that the power station is required to meet growing needs of the Izmir manufacturers.

IRAQ

Power Station Consultants Sought

In the last few months, the Economic Planning Board have decided to invite consultants to tender for a power station of 20 MW capacity to be attached to the Central Baghdad Power Station. Consultants are also being invited to study design of two hydro-electric stations, one on the Samarra Barrage and one on the Derbendi Khan Dam.

RHODESIA & NYASALAND

Nkula Falls Loan Sought

A loan to cover construction of the Nkula Falls hydro-electric scheme in Nyasaland is being sought by the Federal Government, but whether the Government proceeds with the scheme will depend on forecasts for electricity consumption. Last September, the Minister of Power stated that work on the first stage of the scheme, estimated to cost £3 million, could be expected to start in a year and that it would take about three years to complete.

Kariba's First Year

One-third of the total power output of the Federation was generated at Kariba during its first year of operation, says a recent report from the Ministry of Power. The Federation's output in 1960 was 8% above the 1959 figure at 3,819 million units. This figure includes 1,046 million units generated at Kariba, 520 million units imported from the Congo and 59 million units from Mozambique.

UGANDA

Generation Increase

During 1960, 396·5 million units were generated in Uganda and, of this total, more than 40% was exported to Kenya.

Generation showed an increase of 10·6% over the previous year, of which 9·4% was consumed in Uganda.

PAKISTAN

Goalpara Station Opening

The East Pakistan Governor brought into operation a 16 MW thermal power station at Goalpara, in the Khulna district, on 24 Jan. This station was provided with the assistance of the Government of Canada under the Colombo Plan and supplements an existing 10 MW station.

Sukkur Construction

Construction work on the Sukkur 30 MW thermal station is expected to begin within three months. The station and transmission lines financed under the Colombo Plan will be constructed by Canadian firms.

Kundah Commissioning

The second 140 MW station of the Kundah project was commissioned on 18 Jan. by the Canadian Minister for External Affairs. At the same ceremony he also inaugurated the third stage of the project.

INDIA

Fan Sales Up

A threefold increase in production of electric fans during the last five years has resulted in the second plan target being passed by 100,000 fans annually. Fan exports, valued last year at £510,000, are expected to rise to £750,000 in 1961.

Umiam Scheme Progress

Construction work during the first year of the Umiam hydro-electric project has gone according to plan. This project, estimated to take three years to complete, will cost Rs7 crore and will ultimately have a capacity of 36 MW. The Umiam project is nine miles from Shillong and in February this year a start will be made on construction of a 132 kV transmission link. Although Assam is reputed to have the biggest hydro power potential in India, at present only 13 MW plant is in operation. Generators for the new station are being manufactured by a Japanese company.

Power Station Coal Supplies

Under the third Plan period, construction of 17 thermal power station schemes will be continued from the second Five-year Plan and an additional 26 stations have been proposed for construction. A committee has been appointed to investigate utilisation of inferior and low grade fuels required for power production. Estimates show that about 20,000,000 tons of coal will be required by 1965.

Czech Electrical Plant

The heavy electrical plant to be built with Czech aid will be located in southern India, although the State has not yet been selected. Planned to produce turbines and generators for power stations, the original cost of the project, has now been pruned to Rs137 crores.

NEW ZEALAND

Cook Strait Cables Advised

A submarine cable linking North and South Islands is essential for industrial and residential development and will be recommended by the new power planning committee, according to preliminary advice given to the Electricity Minister. The scheme was outlined in ELECTRICAL TIMES for 14 April, 1960.

AUSTRALIA

Higher Interest Rate Loans

Loans for electricity development by both the Tasmanian and Victoria State Electricity Commissions are offered this year at 5¼%. The loan in Tasmania of £570,000 is required to finance development work to meet growing demands for electric power. Already, individual consumption in Tasmania is said to be more than double the average for the whole Commonwealth. In Victoria, the new interest rates will apply to a loan of £2 million, a further instalment of the SEC programme for £29 million of capital works during this year. Expenditure includes £14 million for work in the Latrobe valley, Morwell and Hazelwood areas and a further £12 million for transmission and distribution systems to connect up nearly 30,000 new consumers.

Power Plans for Queensland

The Queensland State Government is reported to be examining electrical development plans costing about £90 million. It is possible that new stations, at least one of which is required in southern Queensland by 1963, may be sited on the West Moreton coalfield. Plans are also being considered for an electrified railway line from Kianga to Gladstone for the shipment of coal to Japan. The plans have been put forward by Thiess Bros. who say that an estimated 3,000,000 tons of coal could be sold to Japan each year. If the plan materialises it will require considerable electrical developments in the State.

Coal Dispute Closes Colliery

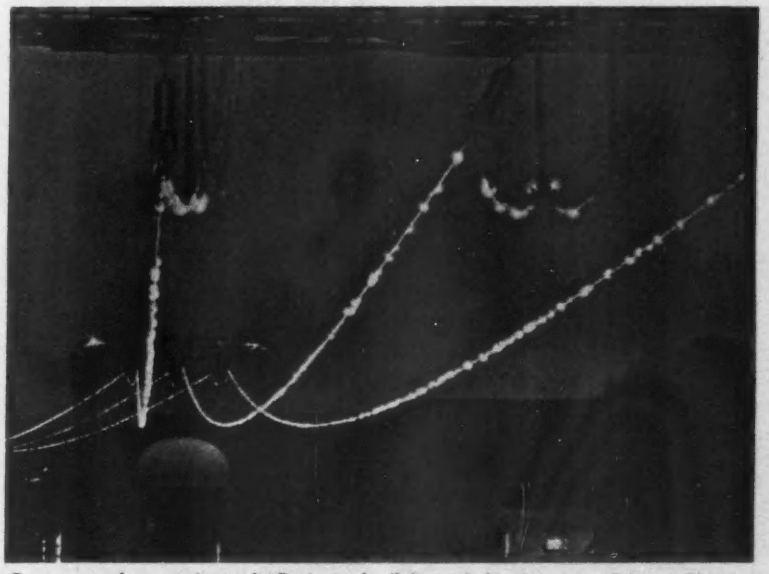
Western Australia's largest colliery at Collie has been closed by the operating company following rejection of their offer to supply 18,000 tons of coal per fortnight at about £3/ton. The Government maintain the price is too high for electricity generation and they have signed contracts with two other opencast collieries. These collieries may not reach their contract output for some months and it is possible that power stations will temporarily be burning oil.

New South Wales Power Plans

During 1961 the NSW Electricity Commission plan to install 220 MW of generating plant. This includes a second 100 MW thermal set at the Tallawarra station and the final 60 MW generator at the 240 MW Wallerawang station. Work continues on the 200 MW Vales Point station scheduled for completion in 1963 and plans are also in hand for investigating power-station sites on the northern coalfields.

Flood-proof Hydro Plant

Feature of the recently opened 6 MW hydro-electric station at the Keepit Dam on the Namoi River is the flood-proof design adopted. Because of heavy flooding possibilities in the district, the power station has been designed to withstand complete submersion up to roof level. The station forms part of the Keepit Dam flood control scheme and is linked to the NSW system by a 66 kV transmission line at Gunnedah, 26 miles to the south west.



Corona on the experimental "Project e.h.v." line of the American General Electric. The line is energised at 750 kV and the corona is due to using the high voltage on a conductor configuration suitable for 460 kV

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

3 Feb.—Feiling U.D.C. Supply: lamps.—See 26 Jan. issue.

3 Feb.—Gt. Yarmouth B.C. Supply: cables.—Advertised 19 Jan. issue.

3 Feb.—Manchester C.C. Electrical installations: Contract 326A, 326 dwellings and five shops; and contract 346, 12 houses.—Advertised 26 Jan. issue.

3 Feb.—Renfrew C.C. (2) Electrical installation, including underfloor heating, in Greenock, Maukinhill and Port Glasgow R.C. primary schools. Applications to County Clerk: R. Urquhart, County Bldgs, Paisley, by above date.

3 Feb.—Uttoxeter U.D.C. Electrical installations, 34 houses, Heath Hse estate. Council Surveyor, Old Bank Hse, 72 High St.

3 Feb.—Walsall C.B.C. Supply of lamps for year. Chief Welfare Officer: R. E. Goakes, 29 Leicester St.

3 Feb.—West Lothian C.C. Electrical installation in Wendyknowe Primary School, Bathgate. Applications to Quantity Surveyor: J. P. Storrier, 31 York Pl, Edinburgh 1, by above date.

4 Feb.—Consett U.D.C. Supply: street lamps.—See 26 Jan. issue.

4 Feb.—Edinburgh Northern Hospitals. Maintenance of electrical installations and equipment; lifts in five hospitals for year.—See 26 Jan. issue.

4 Feb.—Rishton U.D.C. Supply, erection and cabling of 27 Group "A" mercury units on concrete columns.—See 26 Jan. issue.

6 Feb.—Caerphilly U.D.C. Supply: lamps and equipment.—See 26 Jan. issue.

6 Feb.—Carmarthen C.B.C. Supply: goods.—See 26 Jan. issue.

6 Feb.—Duffield P.C. Supply and erection of 74 concrete columns and 140 W sodium lanterns along A6.—Advertised 26 Jan. issue.

6 Feb.—Hunts C.C. Supply of lamps for year. Chief Welfare Officer, County Bldgs, Huntingdon.

6 Feb.—Manchester C.C. Electrical installation in conveniences.—See 26 Jan. issue.

6 Feb.—Strabane R.D.C. (b) Electrical services in Council Offices.—See 26 Jan. issue.

6 Feb.—Uxbridge B.C. Supply: lamps.—See 26 Jan. issue.

6 Feb.—Wallasey C.B.C. Supply of control equipment for electrical engineering laboratory, Wallasey Technical College. Director of Education, Town Hall.

6 Feb.—West Lothian C.C. Electrical work in erection of 84 houses, Westrigg. Applications to County Clerk: J. Calder, County Bldgs, Linlithgow, by above date.

6 Feb.—Worsley U.D.C. (1) Electrical installation in Town's Yd.—See 26 Jan. issue.

6 Feb.—Wrexham B.C. Supply: c.i. 15 ft columns/brackets; totally enclosed lanterns; chokes and capacitors; 80 W colour-corrected m.v. lamps.—Advertised 5 Jan. issue.

8 Feb.—Cardiff C.C. Electrical installations in: (a) County Primary School, Pen-yr-Heol, Llanrumney; (b) Police Station, Llanishen.—See 26 Jan. issue.

8 Feb.—Durham C.C. (Sub-contract a). Electrical installation in Newton Aycliffe Maternity and C.W. Centre School Clinic and Branch Library; (sub-contract a) electrical installation in Wingate new Secondary Modern School. Applications to County Architect, South St, Durham, by above date.

8 Feb.—Stoke-on-Trent C.C. Erection and wiring complete of 850 150 W tungsten and 257 80 W colour-corrected mercury lamps/gear on Class "B" columns/post-top lanterns plus provision of cable. City Engineer and Surveyor, Town Hall.

8 Feb.—Walthamstow B.C. Supply: cords and cables; and lamps.—See 26 Jan. issue.

9 Feb.—Cheadle and Gatley U.D.C. Supply: lamps and lanterns.—See 26 Jan. issue.

9 Feb.—Sittingbourne and Milton U.D.C. Electrical installation in 98 houses, Barrow Grove.—See 26 Jan. issue.

10 Feb.—Neston U.D.C. Installation work in 82 houses.—Advertised 12 Jan. issue.

10 Feb.—Newtownabbey Hospital. Supply of accessories. Secretary, Management Committee, Whiteabbey Hospital, Station Rd, Newtownabbey, Co. Antrim.

10 Feb.—St. Luke's Hospital. Electrical supplies for year. Secretary, Hospital Management Committee, Armagh.

11 Feb.—Broadstairs and St. Peter's U.D.C. Supply of (List 7) coloured lamps. Engineer and Surveyor, Pierremont Hall, Broadstairs.

13 Feb.—Hornsey B.C. Supply of sodium lamps. Borough Engineer, Town Hall, N.8.

13 Feb.—Kidderminster B.C. Electrical installations, on fixed-price basis, in 30 semi-detached "A" type houses. Contract 1. Borough Engineer and Surveyor: J. G. Stewart, 110 Mill St. Deposit £2.

13 Feb.—Norwich C.C. Supply of lamps for year. City Engineer, City Hall.

13 Feb.—Royton U.D.C. Supply: lamps.—See 26 Jan. issue.

13 Feb.—Sunderland C.B.C. Electrical installations in 260 dwellings, Town End Farm Estate.—Advertised 26 Jan. issue.

13 Feb.—Tynemouth C.B.C. Supply: lamps, cable, lighting columns, lanterns, fittings and accessories.—See 26 Jan. issue.

14 Feb.—Armagh. Electrical installation in R.U.C. County H.Q., Palace Row. Room 103, Law Courts Bldg, Belfast 1.

14 Feb.—Barnsley C.B.C. Supply: concrete columns, public lighting tungsten, mercury vapour and sodium lamps.—Advertised 26 Jan. issue.

14 Feb.—Co. Londonderry. Electrical installation, Bellaghy Primary School. Details from Corr and McCormick, 7 Ferryquay St, Londonderry. Deposit £5 5s.

14 Feb.—Hemel Hempstead B.C. Electrical installations: (a) 15 dwellings, Wheelers La; and (b) 15 dwellings, Wood Cres. Borough Engineer: A. H. Turner, High St.

15 Feb.—Edinburgh C.C. Supply: aluminium alloy fluorescent bulkhead fittings.—See 26 Jan. issue.

15 Feb.—Fylde Water Board. Flow and pressure recording apparatus and remote supervisory control equipment for Wyre La Borehole.—Advertised 19 Jan. issue.

15 Feb.—Keynsham U.D.C. Electrical installations for 11 shops and one supermarket at Bath Hill.—See 26 Jan. issue.

16 Feb.—Kincardine C.C. Electrical work in Laurencekirk Secondary School infants' dept. extension. County Architect and Planning Officer, Westfield Hse, Arduthie Rd, Stonehaven.

16 Feb.—King's Lynn B.C. Three centrifugal pumps at No. 2 pump station.—See 26 Jan. issue.

16 Feb.—King's Lynn B.C. Supply of lamps and electrical sundries for year. Borough Engineer: H. G. Ridler, Clifton Hse, 17 Queen St.

16 Feb.—Widnes B.C. Supply of (7) electrical equipment and (8) lamps. Borough Engineer and Surveyor: F. A. J. Knight, Town Hall.

17 Feb.—Belfast C.C. Supplies list: items 22 to 39.—Advertised 26 Jan. issue.

17 Feb.—Croydon C.B.C. Power socket installations in 720 pre-war houses, Mitcham Rd estate. Housing Manager, 71 Park La.—Advertised in this issue.

17 Feb.—Deal B.C. Supply of lamps for year. Borough Treasurer, 1a Victoria Rd.

17 Feb.—Easington R.D.C. Supply of (f) electrical goods for year. Applications to Council Clerk: T. Agar, Council Offices, by above date.

17 Feb.—Staffs Potteries Water Board. Electrically driven pumping plant—six 2½ m.g.d. vertical pumps for rain water and ditto for clear water, all with Laurence Scott motors.—See 19 Jan. issue.

17 Feb.—Staffs Potteries Water Board. Two sets of diesel-driven alternators, each 500 kVA, 415 V, 3-ph., 50 cycles, 428 r.p.m., with switchgear, cabling, etc., for Tittesworth reservoir scheme.—See 19 Jan. issue.

18 Feb.—Coleraine and Portrush. Maintenance of: (List 13) buildings and plant—electrical; (19) radio installations and TV sets; and (21) lifts for year. Secretary, Hospital Management Committee, Coleraine Hospital.

18 Feb.—Halesowen B.C. Supply of (List 12) lamps for year. Borough Engineer and Surveyor, Council Hse.

18 Feb.—Maesteg U.D.C. Supply: electrical fittings.—See 26 Jan. issue.

18 Feb.—Merthyr Tydfil C.B.C. Supply: electrical goods.—See 26 Jan. issue.

20 Feb.—Cardiff C.C. Supply of: (1) concrete columns; (2) lanterns, lamps and control gear; (3) time switches for year. City Surveyor, City Hall.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 115 queries answered this week

"Bodine" electric motors—agents for? W.E.—Batwin Electric Motors Ltd., 331 Sandycombe Rd, Richmond, Surrey.

"Linisher" grinding machines—makers of? G.R.M.—Turner Machine Tools Ltd., 63-68 Princip St, Birmingham 4.

"Cygnet" fans—makers of? J.G.T.—Reelek Appliances Ltd., Reelek Wks, Skimpot Industrial Estate, Luton, Beds.

Underground cable detectors—makers of? P.B.—Rank (Cintel) Ltd., Worsely Bridge Rd, Lower Sydenham, S.E.26; Addison Electric Co. Ltd., Bosworth Rd, W.10.

"Sunset" dimmers—makers of? W.W.—Strand Electric and Engineering Co. Ltd., 29 King St, W.C.2.

"Reform" wellglass lighting fittings—makers of? T.E.—Simon Handling Engrs. Ltd., Cheadle Heath, Stockport, Ches.

Tartan Manufacturing Co. Ltd.—address for? M.E.B.—Wooburn Green, High Wycombe, Bucks.

"Tuscan" flameproof motors—makers of? L.B.T.—Tuscan Engineering Co. Ltd., 34 Great St. Helens, E.C.3.

"Unimax" micro-switches type 2H-BH1—makers of? S.D.—Unimax Division of the W. L. Maxson Corpn., New York, U.S.A.; although the makers are not represented in this country, a similar micro-switch, type CRD, is supplied by Bureess Products Co. Ltd., 129 Victoria St, S.W.1.

20 Feb.—Grimsby C.B.C. (c) Electrical installation, on fixed-price basis, in proposed Grange Primary Infants' School, Cambridge Rd. Borough Engineer and Architect: J. V. Oldfield, Municipal Offices, Town Hall Sq. Deposit £5.

20 Feb.—Nottingham C.C. Two centrifugal pumps, motors, switchgear, etc., for Normanton-on-the-Wolds.—See 19 Jan. issue.

21 Feb.—Salford C.C. Supply: 15 ft concrete columns; 60 W sodium lanterns/equipment; (3) 100-150 W lanterns; (4) time switch/fuse boxes; (5) solar dial synchronous time switches.—See 26 Jan. issue.

21 Feb.—Tyrone C.C. (iii) Electrical installation in new technical institute at Dungannon.—See 12 Jan. issue.

CONTRACTS PLACED

Birmingham Hospital Board. Wiring replacement, Lickey End Group Stores, James Ward (Worcester) Ltd., £1,249; wiring and indicator installation renewal, Ross Cottage Hospital, A. M. Harrower, £1,142. Recommended.

Brighton T.C. Pumping plant: starters, Allen West, £2,048 11s; boosters and submersible, Berry Hill (Plant Division) Ltd., £1,699 10s and £2,350 5s; three submersibles, British Pleuger Submersible Pumps Ltd., £4,054 10s.

Dorchester B.C. Rewiring 82 houses, Victoria Pk estate, Rogers and Dawes Ltd., £1,853. Recommended.

Eccles B.C. Electrical installations, 40 houses, New Hall Farm, N. Cockcroft, £1,799.

Fylde Water Board. Electrical installation, Hodder Wks, Slaidburn, Bennison and Co. (Blackpool) Ltd.

Hartlepool T.C. Electrical installations, 48 houses, Throston area, John Westmoreland and Co., £1,841 2s.

Luton B.C. Electrical installations, ten old people's dwellings, Muswell Close, Runfold estate, J. H. Burtenshaw, £813.

Tynemouth C.B.C. Electrical improvements at Western Junior Mixed and Infants' School, Cairns (Newcastle) Ltd., £649 18s. Recommended.

Wimbledon. Electrical installation in new post office, Herts Electrical Co. (Graham and White) Ltd.

21 Feb.—Wellington U.D.C. Supply of (List 12) lamps and (13) cable and fittings for year. Engineer and Surveyor, 14 Walker St, Wellington, Salop.

22 Feb.—Stirling B.C. Electrical work in erection of 31 houses, St. John St/Academy Rd development. Applications to Burgh Architect and Planning Officer, Old Burgh Bldgs, 65 King St, by above date.

23 Feb.—Ealing B.C. Electrical installation renewal at Drayton Infants' School and Perivale Primary School by contractors on N.I.C.E.I.C. roll.—Advertised 26 Jan. issue.

23 Feb.—Isle of Axholme R.D.C. Sewage ejectors and sludge pump complete with motors, starter and accessories for West Butterwick scheme.—See 26 Jan. issue.

24 Feb.—Irlam U.D.C. Supply of lamps for year. Engineer and Surveyor, Council Offices.

25 Feb.—Argyll C.C. Provision and erection of 56 15 ft steel or concrete columns with Class "B" lamps/lanterns/gear at Dunbeg Village. District Clerk, County Offices, Oban.

25 Feb.—Leyland U.D.C. Supply of (Item 12) street lighting lamps for year. Engineer and Surveyor: F. D. Howe, Council Offices.

27 Feb.—Golborne U.D.C. Supply: Class "B" concrete and c.i. columns, lanterns, sodium lamps and gear for 188 lighting units.—See 26 Jan. issue.

2 March—Belfast C.C. Goods lift installation in Education Dept., 40 Academy St. City Architect's Dept., 40 Academy St.

3 March—Belfast C.C. 33/6·6 kV step-down transformers. Specification W.187 from Electricity Dept., East Bridge St. Deposit £2 2s. —Advertised in this issue.

6 March—Airdrie B.C. Supply: lamps.—See 26 Jan. issue.

8 March—Bridge-Blean R.D.C. 60 g.p.m. at 64 ft head duplicate sewage pumps, etc., for Chislet scheme. Engineer and Surveyor, 41 Old Dover Rd, Canterbury.

20 March—Nottingham C.C. Centrifugal well pumps, motors, switchgear, etc., for Basford. Engineer and General Manager: B. W. Davies, Water Dept., Castle Boulevard. Deposit £2 2s.

21 March—Bedfordshire C.C. (b) Electrical installation on fixed-price basis, in proposed Clapham/Oakley County Secondary School. —See 19 Jan. issue.

No date stated—Chigwell U.D.C. New main road lighting.—See 19 Jan. issue.

No date stated—Herts C.C. Applications invited for inclusion in list for electrical work. County Council Clerk, County Hall, Hertford.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

10 Feb.—America. Three 12 kV and three 121 kV lightning arresters. Dept. of the Interior, Bureau of Reclamation, C. S. Shisler, Bldg 53, Denver Federal Center. B.o.T. (ESB/2728/61).*

12 Feb.—Kuwait. Lighting fittings, six items, including decorative, fluorescent and bulkhead types. Dept. of Electricity, Water and Gas. B.o.T. (ESB/2741/61).*

14 Feb.—Greece. 800 fluorescent lamps; 300 60 W sodium lamps; 20,000 2·8-3·0 mm. diameter copper tubes. Purchasing and Stores Dept., Hellenic State Railways (SEK), 34 Themistocleous St, Athens. B.o.T. (ESB/3016/61).*

15 Feb.—America. Static shunt capacitor equipment. Dept. of the Interior, Bonneville Power Admin., 1001 N.E. Lloyd Blvd., Portland. B.o.T. (ESB/3042/61).*

15 Feb.—Pakistan. 4,000 lb resin cored solder. Director-General, Dept. of Supply and Development, Frere Rd, Karachi. B.o.T. (ESB/2702/61).*

16 Feb.—America. One 69 kV 50,000/66,667 kVA voltage regulating transformer. Dept. of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center. B.o.T. (ESB/976/61).*

17 Feb.—Rhodesia and Nyasaland. Three 300 kVA transformers. Secretary, Federal Tender Board, P.O. Box 8075, Causeway, Salisbury. B.o.T. (ESB/2760/61).*

17 Feb.—S. Africa. Overhead conveyor system for S.A. Railways, Coach Workshops, spray painting sections. Tender Board Chairman, P.O. Box 7784, Johannesburg. B.o.T. (ESB/908/61).*

20 Feb.—India. Factory for water and electric meter components. Industries and Commerce Directorate, Jammu and Kashmir Government, Jammu. B.o.T. (ESB/3035/61).*

22 Feb.—Pakistan. Network analyser. Director-General, Dept. of Supply and Development, Frere Rd, Karachi. B.o.T. (ESB/955/61).*

23 Feb.—America. Autotransformer 3-ph. 60 c/s and voltage regulator. Dept. of Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center. B.o.T. (ESB/977/61).*

24 Feb.—India. 10,000 yd twin 1/·028 p.v.c. telephone wire. Director-General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (ESB/924/61).*

TRADE NOTES

Changes of Address. W. L. Turner and Co. have now moved to 22-36 Rochester Row, S.W.1.

J. and E. Hall Ltd. are closing their London office at 10 St. Swithin's La, E.C.4, on 3 Feb. From that date the company will operate in London from 60 Rochester Row, S.W.1, 1-2 Silex St, S.E.1, Royal Albert Dock, and 1-5 Queen St, E.C.4.

As from 8 Feb. the address of Power Connectors Ltd. will be Barry Hse, Worple Rd, Wimbledon, S.W.19. Telephone: Wimbledon 6397.

New Factory. The British Rototherm Co. Ltd. have acquired additional factory premises in Wimbledon, S.W.

New Phone No. From 6 Feb. the telephone number of Chronos Wks, head office of Smiths Industrial Division, will be Gladstone 6444.

Changes of Name. The title of G. H. Osborn Building Products Ltd. has been changed to Osma Plastics Ltd.

H. and E. Lintott Ltd., of Horsham, have changed their name to Lintott Engineering Ltd.

Renamed. The Instrument Division of Newman Industries Ltd. has been renamed Newman Electronics Division, reflecting the expansion of the division.

Representative. Easipower Appliances Ltd. have appointed Mr D. Sinclair, 59 Stanmore Rd, Mount Florida, Glasgow S.2 (telephone: Battlefield 1978), as their Scottish representative. Wood's Agencies (Glasgow) Ltd. continue to act as Easipower's distributing agents up to 31 March.

E.W.F. Ebor Electrical (Wholesale) Ltd., Queen's Staith, Skeldergate, York, have been elected a member of the Electrical Wholesalers' Federation.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Activair. B783,006. Class 11. Electric space-heaters for domestic use incorporating electric fans, etc. Kenwood Manufacturing (Woking) Ltd., 78 Old Broad St, E.C.2.

Alf. 792,600. Class 9. Electronic apparatus for automatically controlling the operation of machines, etc. Hunting Engineering Ltd., Luton Airport, Beds.

Dometic. B794,450. Class 11. Domestic refrigerators for export. Electrolux Ltd., Electrolux Wks, Oakley Rd, Luton, Beds.

Duoclef. 810,044. Class 9. Covered electric wire and electric cables, etc. Wandleside Cable Wks Ltd., 106 Garratt La, Wandsworth, S.W.18.

E.S.G.E. B785,313. Class 7. Sawing, grinding, polishing machines and motors all being electric, etc. Esge Gschwend and Spingler K. G., Elektromotoren-und Apparateban, Neuffen/Wurttemberg, Germany.

H in diamond design. 777,290. Class 9. Switches, sockets and plugs all being electric. Apparatus consisting of thermostats and electric switches for automatically controlling oven and hot-plate temperatures, etc. "Diamond H" Switches Ltd., Gunnersbury Ave, W.4.

Memmert. B806,391. Class 11. Electrical apparatus and lamps, etc. Firma Willi Memmert, 38a Aussere Rittersbacher Strasse, Schwabach, Bavaria, Germany.

Rex. 796,099. Class 11. Refrigerators. Commercial Managements Ltd., 90-94 Archway Rd, N.19.

Rolex. 809,536. Class 9. Electroplating apparatus, etc. Carola Products Ltd., Carola Wks, Foundry La, Smethwick, Birmingham.

Sand-Man. 811,326. Class 10. Electrically heated blankets. Herton and Co., West Winds, Spion Kop, Thorner, near Leeds, Yorks.

Sanyo in design. 805,288. Class 7. Motors, dynamos, electric well pumps, food mixing machines and washing machines, etc. Sanyo Denki Kabushiki Kaisha, 18 2-Chrome, Keihan-Hondori, Moriyuchi, Osaka, Japan.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Engelhard Hanovia Ltd. Mr G. P. Allan, Orchard Lodge, Orchard Rd, Shalford, Surrey, appointed liquidator at extraordinary general meeting on 3 Jan. for the purpose of voluntarily winding-up.

Icemaster Ltd. Meeting of creditors to be held at Chartered Accountants' Library, 5 Fenwick St, Liverpool, on 23 Jan., at 2.45 p.m.

Central Appliances Ltd. Mr S. B. Harman, 101 High St, Orpington, Kent, and Mr G. A. Wale, Walter Hse, 418-422 Strand, W.C.2, appointed liquidators for the purpose of voluntarily winding-up.

A. W. Holmes (Radio and Electrical Services) Ltd. Mr R. A. Hawken, 1 John St, Bedford Row, W.C.1, and Mr G. E. Radford, 12 Portland St, Southampton, appointed liquidators for the purpose of voluntarily winding-up.

Mills (Electrical Services) Ltd. Mr J. S. Bradley-Hole, 7 Old Steine, Brighton 1, and Mr G. A. Wale, 418-422 Strand, W.C.2, appointed liquidators at extraordinary general meeting on 12 Jan. for the purpose of voluntarily winding-up.

Maypole Electrical Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 6 Feb. Persons intending to appear to notify H. Montlake and Co., 247 High Rd, Ilford, by 1 p.m., 4 Feb.

Darwen Electrics Ltd. Mr G. H. Eaves, 47 Mosley St, Manchester 2, appointed liquidator at extraordinary general meeting on 16 Jan. for the purpose of voluntarily winding-up.

Regent Electrical Distributors (Middx) Ltd. Mr J. T. Morgan, 100 Park St, W.1, appointed liquidator at extraordinary general meeting on 11 Jan. for the purpose of voluntarily winding-up.

Darwen Electrics Ltd. Creditors to send details to liquidator: G. H. Eaves, 47 Mosley St, Manchester 2, by 28 Feb.

Reeves Electrical and Radio Co. Ltd. Mr K. R. Cork, 19 Eastcheap, E.C.3, appointed liquidator as from 30 Dec.

Electroservice (R. W. Taylor) Ltd. Winding-up order dated 16 Jan.

Mayfair Electrics Ltd. Winding-up order dated 16 Jan.

Springhill Electrical Services Ltd. Winding-up order dated 16 Jan.

A.J.B. Appliances (Derby) Ltd. and **D. E. Cooper and Son Ltd.** Petitions for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 6 Feb. Persons intending to appear to notify Cochrane and Cripwell, 119 Finsbury Pavement, E.C.2, by 1 p.m., 4 Feb.

Verdik Sales Ltd. Meeting of creditors to be held at Winchester Hse, Old Broad St, E.C.2, on 7 Feb., at 11.15 a.m.

Ramdis (Sales) Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 6 Feb. Persons intending to appear to notify Clifford Turner and Co., 11 Old Jewry, E.C.2, by 1 p.m., 4 Feb.

Wm. Gregory (Electrical Installations) Ltd. Meeting of creditors to be held at Bacchus Hotel, Sutton-on-Sea, Lincs, on 9 Feb., at 3.45 p.m.

A. Barlow and Co. Ltd. Last day for receiving proofs for intended dividend: 10 Feb., to liquidator: R. A. Rodgers, 25 Bedford Rd, W.C.1.

Partnerships Dissolved

Manchester. Partnership between D. Jepson, S. Barnes and S. Jepson, electrical engineers, carrying on business as S. Barnes and Co., at 24a Turner St, dissolved as from 31 March, 1960. S. Barnes retires and all debts to be paid by the remaining partners who are carrying on the business.

Heysham. Partnership between R. M. G. Innes and T. E. Wood, electrical and electronic retailers and repairers, carrying on business as Heysham Electrical Co. at 22 Heysham Rd, Morecambe, and Heysham, dissolved as from 21 Nov. Mr T. E. Wood retires from the business.

BANKRUPTCY ACTS

Receiving Orders

Leicester. I. Challoner, radio and electrical retailer, carrying on business, in partnership, as Midland Radiovision Services, at Main St, Humberstone. Receiving order dated 16 Jan.

Nottingham. D. Peters, electrician, formerly carrying on business at 2 Manor Rd, Carlton. Receiving order dated 18 Jan.

Edmonton. B. C. Renny, electrical retailer, carrying on business at 209 Baker St, Enfield. Receiving order dated 19 Jan.

Pontypridd and Ystradyfodwg. W. I. King, electrical apparatus dealer, formerly carrying on business at Central Arcade, Pentrebane St, Caerphilly. Receiving order dated 19 Jan.

Kingston upon Hull. P. A. Thomson, appliance retailer and contractor, formerly carrying on business in partnership as Thomson Bros. and Reed and as Thomson Bros. at 84a Holderness Rd. Receiving order dated 23 Jan.

First Meetings and Public Examinations

Croydon. F. H. C. Bishop, electrical dealer, carrying on business as Wellington Electrics at 31 High St, St. Mary Cray. First meeting: 11 a.m., 3 Feb., at 58-61 York Terr, Regent's Pk, N.W.1; and public examination: 11 a.m., 16 March, at County Court, Scarbrook Rd, Croydon.

Kingston upon Hull. M. Dubb, electrical contractor, carrying on business at 204 Boothferry Rd, and 512 Anlaby Rd, Hull. First meeting: 11 a.m., 3 Feb., at Official Receiver's Office, Burton's Bldgs, Alfred Gelder St, Hull; and public examination: 10.30 a.m., 13 March, at The Guildhall, Hull.

Appointment of Trustee

Truro and Falmouth. G. M. Hardy and J. F. King, electrical dealers, carrying on business as Hardy and King at Hamilton Hse, The Platt, Wadebridge, Cornwall. Mr J. E. Ellis, Ford Pk Chmbrs, Ford Pk Rd, Plymouth, appointed trustee as from 18 Jan.

Intended Dividends

Brighton. A. L. Lankester, building and electrical contractor, carrying on business at 65 St. Thomas's Rd, Worthing. Last day for receiving proofs for intended dividend: 7 Feb., to trustee: J. S. Bradley-Hole, 7 Old Steine, Brighton 1.

Ipswich. L. A. L. Leech, contractor and engineer, formerly carrying on business as T.L. Installation Co. (Norfolk and Suffolk) at 129a Fore St. Last day for receiving proofs for intended dividend: 10 Feb., to trustee: C. A. Taylor, 3-5 Northgate St, Ipswich.

Liverpool. V. P. Jackson, electrical and radio engineer, carrying on business at 311-313 Aigburth Rd. Last day for receiving proofs for intended dividend: 7 Feb., to trustee: H. S. Oliver, 5 Rumford Pl, Chapel St, Liverpool 3.

Dividend

Luton. C. R. Clarke, electrical contractor, formerly carrying on business at Kingham Way, Luton. Dividend per £: 2¼d. payable at Official Receiver's Office, 15 Guildhall Rd, Northampton.

Application for Discharge

Plymouth. D. Boulton and L. C. Turner, wireless and electrical engineers, formerly carrying on business at Old Town Ave. Application for discharge to be heard at 10.30 a.m., 14 Feb., at 4 Elliot St, The Hoe, Plymouth.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

A. and N. Transistor Applications Ltd., 1 Fitzroy Sq, W.1. Nom. cap.: £100. Dirs.: Francis A. Davies, Edmund J. Mander, Albert Cole, Arthur F. B. Cooke and Wm. Woods-Hill.

Alex-Electrical Ltd., 191 North St, Romford, Essex. To take over business of an electrician and electrical engineer carried on at Romford by A. S. McBain, etc. Nom. cap.: £2,000. Dirs.: Alexander S. McBain and Bernard D. Davis.

E. W. Aspden Ltd., 151-153 Red Bank Rd, Bispham, Blackpool. Electrical engineers, etc. Nom. cap.: £2,500. Dirs.: Ernest W. Aspden and Harry C. Smith.

Baxter Manufacturing (Haverhill) Ltd., 6 Nesbitts Alley, High Barnet, Herts. Mechanical and electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Thomas R. Francis and Thomas A. Francis.

R. Bland Rentals Ltd. Hirers of and dealers in electrical appliances, etc. Nom. cap.: £1,000. Permanent dirs.: Roy Bland, 34 St. Mark's Cres. Maidenhead, Berks; and Graham J. Strickland.

Blazon Ltd., 2 Brunswick Sq, Bristol 2. Nom. cap.: £5,000. Manufacturers of and dealers in neon and other electric signs, etc. Dirs.: Norman H. Humphreys and Ernest H. Taylor.

G.E.M. Electrical (Tottenham) Ltd., 89-91 Newman St, W.1. Nom. cap.: £500. Dir.: Kenneth Martin.

Gillett and Sibert Ltd. Manufacturing, mechanical, electrical, general engineers and instrument makers, etc. Nom. cap.: £10,000. Dirs.: Alan C. Sibert, 161 Finborough Rd, S.W.10; and Jean M. Gillett.

Gold Seal Electronics Ltd., Ripple Wks, By-pass Rd, Barking, Essex. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: R. H. Malthouse and M. Edwardes-Evans.

J.M.C. Ltd., 181a Bath Rd, Slough. Electrical and mechanical engineers, etc. Nom. cap.: £3,100. Dirs.: to be appointed by subs. Subs.: John E. Norton and Maurice Bennett.

Kennet Contractors Ltd. To carry on business of civil, mechanical, electrical, consulting and general engineers, etc. Nom. cap.: £100. Dirs.: Guy T. Shoosmith, Gangbridge Hse, St. Mary Bourne, Hants; Michael A. H. Walford, Stamford R. F. Vandersteegen-Drake, Donald W. R. Addicott and Arthur R. Freeman.

Marwin (Electrical) Co. Ltd., 101 Lower Lichfield St, Willenhall, Staffs. Nom. cap.: £1,000. Dirs.: Ronald B. Walford, Ronald S. Cresswell, Mrs M. Walford and Mrs Winifred Cresswell.

Overhead Line Fittings Ltd. To carry on business of electricians; to manufacture and assemble line fittings for overhead transmission lines, etc. Nom. cap.: £3,000. Dirs.: Charles W. Allen, 2 Oakhill Tean, Stoke-on-Trent: Alan Wellings; and Joseph Prestwick.

R.W.R. Enterprises Ltd., 22 Russell St, Brighton. Electricians, electrical engineers, etc. Nom. cap.: £500. Dirs.: Alfred G. Richley and Ian G. Richley.

Seddon and Fleischer Ltd. Civil, constructional, hydraulic and electrical engineers, etc. Nom. cap.: £100. Dirs.: Ernest Seddon, "The Laurels," Canal Rd, Congleton, Ches; Kurt K. Fleischer, Paul Fletcher, Jonas Seddon and Frank Seddon.

Shoplumination Ltd., King Edward Sq, Sutton Coldfield. Electrical engineers, etc. Nom. cap.: £100. Dirs.: Denys G. Lowe and Raymond A. Showell.

Sulcott Ltd., 43 Cunningham Park, Harrow, Middx. Electrical engineers, etc. Nom. cap.: £100. Dirs.: James G. Sullivan and John M. Scott.

T. and K. Precision Ltd., 2 Hervey St, Northampton. General, electrical and precision engineers, etc. Nom. cap.: £1,000. Dirs.: John E. Penny and Keith Forster.

BUSINESS PROSPECTS

Aberdeen. N.E. Regional Hospital Board, Aberdeen, plans school of physiotherapy.

Acton. Express Dairy Co. plan cold store at 100 Bollo La, W.3.

Alcester R.D.C. Tenders: Six flats, Seggs La; 12 flats, Henley St; 12 bungalows, Studley. Architects: F. B. Andrews and Son, 95 Colmore Row, Birmingham.

Barnes B.C. Tender: 12 flats, Lambert Ave, together with small outbuildings. Engineer and Surveyor.

Bath T.C. £25,000 welfare centre planned at Green Park.

Bedford B.C. Tender: Six-storey municipal offices. Engineer and Surveyor, Newnham Hse, Horne La, Bedford.

Belfast T.C. Tender: 56 terrace houses at Hogarth St. Architect.

Berwick. N. Dent, Finkle St Chambers, Richmond, Yorks, architect for J. P. Simpson and Co's Ord Rd maltings.

Birmingham. J. H. D. Madin, 83-85 Hagley Rd, Edgbaston, Birmingham 15, architect for B.B.C's new headquarters on nine-acre site at Pebble Mill Rd. Television and sound administrative buildings will be planned.

Blackburn. Corporation plans adult training centre Gladstone St, and hostel at Burnley Rd.

Bootle B.C. Tender: 94 flats and maisonnettes, Strand Rd and Jersey St. Surveyor.

Cardiff. Guest Keen and Nettlefolds Ltd. plan steel mill and warehouse, canteen extensions, billet storage buildings and reinforcement bar bending factory all at Tremorfa Works.—City Architect has scheme for £105,315 development of a cleansing depot at Trade St.

Carlisle. Newcastle Hospital Board, Benfield Rd, plan operating theatre at City Maternity Hospital.

Coatbridge. Lambert Engineering Co. (Glasgow), Burnfield Wks, Burnfield Rd, Giffnock, plan factory on 13-acre site at town centre.

Cookstown, Co. Tyrone. R.D.C. plan 56 houses at Church St.

Coventry. T.C. approves five-storey showrooms in Hales St for John Anslow Ltd., 15 High St.—Education Committee approves following special school projects. Day school to replace Baginton Fields at £100,000. Day school for maladjusted children at £25,000. —Bellamy and Wareham, 57 The Parade, Leamington Spa, quantity surveyors for rebuilding of Town Thorns School.

Durham. Newrich and Blackbell, 58 John St, Sunderland, architects for Territorial Army and Air Force Association new headquarters at Old Elvet.

Eastbourne B.C. Tender: Central library, Grove Rd, Eastbourne. Clerk.

Edinburgh. Dean of Guild Court approves plans for £100,000 premises at Moray Hse College of Education. — Schweppes plan £30,000 extensions at Bankhead Broadway.

Enfield B.C. Tender: 24 flats, 26 houses in Hoe La. Engineer.—Thorn Electrical Industries Ltd., Upper St. Martin's La, W.C.2, plan factory offices and canteen at Great Cambridge Rd.—B.T.C., Marylebone Rd, N.W.1, plan road motor depot at Turkey St Station.

Felling U.D.C. J. H. Napper and Ptnrs, 133 Osborn Rd, Newcastle, architects for £190,000 scheme for construction of new swimming baths.

Galston B.C. Tender: 32 houses in redevelopment area at Titchfield St. Clerk.

Gateshead B.C. Tender: Wrekenton (Fell Dyke) Junior School for 480 pupils. Engineer.

Gt. Britain. Fairlanes Bowling Ltd., a new Anglo-American company, are negotiating for sites in London, Manchester and Birmingham for six bowling centres. Turriff Construction Corpn, Budbrooke Rd, Warwick are involved.

Great Yarmouth. Scheme for replacement of columns and fittings for street lighting on North Drive and over Jellicoe Rd bridge at cost of £4,300.—Street lighting schemes for Duke Rd and Beach Rd to cost £2,100 and £1,900, respectively.

Grimsby. Findus Ltd., 13 New Burlington Pl, W.1, plan production centre and cold stores on nine-acre site.

Halifax. Leeds Regional Hospital Board, Harrogate, plans £41,000 out-patients' department, etc., at St. Hones Hospital.

Hastings. Charles Wilfred Box, 115 Gower St, W.C.1, architect for licensed or hotel premises with residential accommodation on upper floors at Clive Hotel, Old London Rd.

Hemel Hempstead. Fuller, Hall and Foulsham, 212 High Holborn, W.C.1, architects for £400,000 factory and offices at Mayland Ave, for Addressograph and Multiograph Ltd.—Sutcliffe Taylor and Ptnrs, 5 Manchester Sq, W.1, architects for Tucker and Richardson's Eton Rd factory.

Holland C.C. Tender: Old people's home in Grange Drive, off Halmergate, Spalding. Architect.

Honiton B.C. Tender: 32 three-bedroom houses at Sidmouth Rd. Clerk.

Horsham. H. Trinick and Ptnrs, 11 Old Queen St, S.W.1, quantity surveyors for extensions to Colliers Grammar School.

Hull. Corporation Markets and Abattoirs Committee plan stage one of Central Abattoir in Cogan St at £451,631.

Lancaster. Manchester Hospital Board, Cheetwood Rd, Manchester 8, plans boiler house and plant at Royal Hospital to cost £116,923.

Leicester. Pick, Everard, Keay and Gimson, 6 Millstone La, Leicester, architects for Sheffield Regional Hospital Board's occupational therapy centre at Carlton Hayes Hospital, Narborough.

Leigh-on-Sea. Harrington's, 103 London Rd, Southend, plan three shops, soft drinks factory and staff housing on site of Corona Cinema.

Limavady R.D.C. £50,000 offices planned on Dungiven Rd.

London. Bryden and Woodford, 33 Catherine Pl, S.W.1, quantity surveyors for £20,000 Parian St warehouse, E.14, for W. W. Howard Bros and Co.—E.E.B., Northmet Hse, Cannon Hill. N.14, plan offices, workshops, etc., at Pickham Way, Wood Green, N.—Nightingale and Ambrose, 27 John Adam St, W.C.1, architects for Bird's Eye Foods' planned £77,000 offices and cold store at Lower Sydenham Rd.—Knapton and Deane, 6 Martin La, E.C.4, architects for factory and offices on Great West Rd, Chiswick.—Enterprise Aluminium Co., Normal Rd. S.E.10, plan foundry building.—Governors of Colfe's Grammar School, Horn Park La, plan rebuilding at cost of £256,734.—Plaskett Marshall, 59 Gordon Sq, W.C.1. architect for new St. Paul's School, Station Rd, N.—H. Wright and Tidmarsh, 35 Pentonville Rd, N.1, architects for offices on site of 42-54 Featherstone St, Finsbury, E.C.—Thompson and Alexander, 6 Cromwell Pl, S.W.7, quantity surveyors for £100,000 office block at Savile Row and Old Burlington St, W.1.—E. S. Boyer and Ptnrs, 88 Grays Inn Rd, W.C.1, architects for multi-storey office building at 114 Tottenham Court Rd junction with Grafton Way.—W. P. Orr and Ptnrs, 40 Goodge St, W.1, architects for Windmill St, W.1, showrooms and offices.

Loughborough T.C. Wellington St clearance area to be developed with houses, flats and shops. Surveyor.

Louth T.C. £40,000 indoor swimming pool proposed. Surveyor.

Lowestoft. J. L. Kier and Co., 7 Lygon Pl, S.W.1, contractors for £920,000 scheme for factory and timber storage buildings for Boulton and Paul. Scheme includes construction of quay and reclaiming land.

Maidstone B.C. Engineer to invite tenders for multi-storey car park in Medway St.

Middlesbrough. Kitching and Co., 21 Alber Rd, architects for office extensions at Newport Rd for Reddfusion (North East) Ltd., and additions to shop at Linthorp Rd. —Garbutt, Archibald and Archibald, 23 Albert Rd, architects for church hall at Marton Grove Rd, for St. Oswald's Church Council.—T. Duncanson and Sons, Acklam Rd, contractors for 219 dwellings on Ulla Farm Estate.—North and Ptnrs, Maidenhead, architects for alterations and additions at Corporation Rd departmental store of Baker Bros.

Morpeth. Northumberland C.C. plans aged persons' homes at Ashington and Berwick to cost £65,000.

Newcastle T.C. Tender: Welfare Centre with two flats above at Strathearn Way, Fawdon. Architects: Ryder and Yates, Churchill Hse, 87 Jesmond Rd.—M. Greenwood, Broadway Court, Westminster, London, architect for £45,000 four-storey science block at Central High School for Girls' Public Day School Trust.

Newport. Hectory Hamilton and Assoc., 6 Stratton St, W.1, architects for £600,000 three-storey blocks of shops surmounted by 15-storey tower office block for District Properties Ltd.

Newtown and Llandidloes R.D.C. Tender: 30 houses on sites at Bettws, Carno, Kerry, Caersws, Manafon. Architect.

Nottingham. Ministry approves E.C's plan for £133,700 St. Catherine's R.C. School.

Nuneaton T.C. New abattoir, cold store and meat market planned at £135,000. Surveyor.

Orpington U.D.C. £100,000 extensions to Civic Centre planned. Quantity surveyors, Langdon and Every, 21 Russell Sq, W.C.1.

Oxford. Basil Ward, 32 Wigmore St, W.1, architect for University's £400,000 eight-storey laboratory block as extension to bio-chemistry department.—David Roberts, School of Architecture, Scroope Terr, Cambridge, architect for new "Sacher" building to house 40 undergraduates.

Peterlee. Development Corporation, Shotton Hall, plan 106 houses on Chapel Hill Estate.

Plymouth T.C. Tender: 84 flats at Kerstreet, Devonport. Architect.

Portadown B.C. Tender: (1) 76 dwellings at Brownstown Rd and (2) eight houses at Armagh Rd. Clerk.

Rawtenstall B.C. Tender: Block of eight flats, Burnley Rd, Water. Engineer.

Redditch. Pomeroy Developments Ltd., plan redevelopment of Unicorn Hill.

St. Helens. Industrial estate planned on 13-acre Parr site to cost £¼ million. Four factories to be built by Delta Group.

Sheffield. Ronald Ward and Ptnrs, 29 Chesham Pl, S.W.1, architects for £¼ million office block at Leopold St for Abbey National Building Society.

Strood R.D.C. Tender: 18 flats and 24 houses at Swingate Estate, Cliffe. Engineer.

Swadlincote U.D.C. Tender: Two blocks of three-storey flats totalling 32 flats. Clerk.

Tyrone C.C. New headquarters building to cost £145,000. Secretary, County Council, Omagh, Co. Tyrone.

Uxbridge B.C. Tender: Three blocks of one-bedroom flats, three storeys high, at Leybourne Rd, Hillingdon. Surveyor.

Warwickshire. C.C. Welfare Committee plans following old people's homes, Leamington Spa, £63,830; Rugby, £55,000; a home for the north of the county, £55,000.

Wednesbury. L. Dainty, Leighswood Grove, Aldridge, Staffs, contractors for factory and office extensions at Bridge St for Richard Berry and Co.—Provision of sodium lighting in Oxford, Alma, Elwell and Friar Streets and mercury lighting in Hobs Rd, to cost £1,800.

West Hartlepool. F. F. Johnson, 16 High St, Bridlington, Yorks, architect for reconstruction of Greatham Hospital and chapel, the rebuilding of Greatham Hall and erection of four cottages in hospital grounds.

MEETINGS TO NOTE

THURSDAY, 2 FEB.

I.E.E. "Silicon Power Rectifiers," A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N. Eastern). "Street Lighting," W. R. Stevens, and "A Survey of Street Lighting and Its Future," W. R. Stevens and H. M. Ferguson. Carlisle Technical College. 7 p.m.

I.E.E. (S.W. Scotland). Sixth Graham Clark Lecture: "Engineering and Civilisation," Sir Hugh Beaver. Joint meeting with the Institutions of Civil and Mechanical Engineers. Royal College of Science and Technology, Glasgow. 7.30 p.m.

I.E.E. (Bristol Graduates and Students). "Some Applications of Magnetic Recording," H. M. Harrison. Lecture Theatre, College of Technology, Ashley Down. 7 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Automatic Control of Steel Rolling Mills," W. N. Jenkins. Hoffmann's Social Hall. 7.30 p.m.

I.E.S. (Glasgow). "Office Lighting," L. H. Hubble. British Lighting Council, 29 St. Vincent Pl. 6.30 p.m.

PLASTICS INSTITUTE (Southern). "The First Year of Operation of the Free Trade Area with Particular Reference to Rubber and Plastics." L. L. Gordon. Joint meeting with I.R.I. Southern section. Chemistry Dept., University of Southampton. 7.30 p.m.

A.S.E.E. (Brighton, Hove and District). "Motor Control Centres," N. E. Steptoe. New Imperial Hotel, First Ave, Hove. 7.30 p.m.

I.E.E. (S.E. Scotland). Dance. Charlotte Rooms, Edinburgh. 8 p.m.

CHIEF TECHNICAL ASSISTANTS' ASSOCIATION. "A Visit to Beunos Aires," L. H. Welch. British Lighting Council, Brettenham Hse, Lancaster Pl, W.C.2. 6.30 p.m.

FRIDAY, 3 FEB.

I.E.E. (Medical Electronics Group). Discussion: "Recent Technical Developments in Eye Movement Recording." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (N.W. Utilisation Group). Dinner-dance. Locarno Embassy Suite, Washway Rd, Sale. 7.15 p.m.

I.E.E. (N. Ireland). Dinner-dance. Grand Central Hotel, Belfast. 7.45 p.m.

I.E.E. (N. Scotland). Sixth Graham Clark Lecture: "Engineering and Civilisation," Sir Hugh Beaver. Joint meeting with the Institutions of Civil and Mechanical Engineers. Dundee Technical College. 7.30 p.m.

I.E.E. (S. Midland). Annual dinner. Grand Hotel, Birmingham 7 p.m.

I.E.E. (N.W. Utilisation Group). Annual dinner-dance. Embassy Rooms (Locarno), Washway Rd, Sale. 7.15 p.m.

IPSWICH AND DISTRICT ELECTRICAL ASSOCIATION. Annual dinner. Great White Horse Hotel.

PLASTICS INSTITUTE (N. West). "Plastics in Industry—Domestic Appliances," H. J. Sharpe. Textile Institute, 10 Blackfriars St, Manchester 3. 6.45 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Fawley). "Instrumentation in Radio Astronomy," Dr H. P. Palmer. Admin. Bldg, Esso Refinery. 5.30 p.m.

A.S.E.E. (Liverpool and District). "Static Switching Control Systems," J. N. Fletcher. Industrial Development Centre, M.A.N.W.E.B., Paradise St. 7.30 p.m.

A.S.E.E. (Stoke and Crewe). "Electrical Catering Equipment," H. Meadowcroft. Royal Hotel, Crewe. 7.30 p.m.

SATURDAY, 4 FEB.

A.S.E.E. (Manchester). "Heavy Industrial Control Gear," C. V. Curran. Engineers' Club, Albert Sq. 7.15 p.m.

MONDAY, 6 FEB.

I.E.E. (Mersey and N. Wales). "The Logical Design of Electrical Networks Using Linear Programming Methods," U. G. W. Knight. Royal Institution, Colquitt St, Liverpool. 6.30 p.m.

I.E.E. (S. Midland). "Development of H.V. Air-break Circuit-breakers with Insulated-steel-plate Arc Chutes," F. S. Fay, J. A. Thomas, D. Legg and J. S. Morton. James Watt Memorial Institute, Birmingham. 6.30 p.m.

I.E.E. (S. Midland). "Cosmic Thunderstorms," C. E. R. Bruce. Winter Gdns, Gt. Malvern. 7.30 p.m.

I.E.E. (Maidstone). "Road Heating," L. H. Carmalt. Maidstone Technical College. 7 p.m.

ROYAL SOCIETY OF ARTS. Cantor Lecture: "The Chemical and Plastics Industries," James Taylor. John Adam St, Adelphi, W.C.2. 6 p.m.

N.E. ELECTRICAL CLUB. "Highways of the Air," Captain O. P. Jones. County Hotel, Neville St, Newcastle upon Tyne. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Data Processing Section). "The Universal Decision Element," Prof J. E. Parton and A. Rose. Manson Hse, 26 Portland Pl, W.1. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (S. Yorkshire). "Some Aspects of Instrumentation in Steelworks," Dr R. H. Baulk. University, St. George's Sq, Sheffield 1. 7 p.m.

SOCIETY OF ENGINEERS. Presidential address: W. E. Humphrey. Geological Society, Burlington Hse, W.1. 5.30 p.m.

A.S.E.E. (Bolton). "Control Instruments." Railway Hotel, Trinity St. 7.45 p.m.

A.S.E.E. (Essex). "Automatic Control," Dr W. L. Stern. Angel Hotel, Ilford Broadway. 8.15 p.m.

A.S.E.E. (Leeds). "Instrument Aids in Obtaining Higher Boiler Efficiency," J. W. Nixon. Gt. Northern Hotel. 7.30 p.m.

TUESDAY, 7 FEB.

I.E.E. (Measurement and Electronics Section). "Magnetic Properties of Thin Films for Computing Devices," E. M. Bradley. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (E. Anglian). "The Deltic Locomotive," C. M. Cock. (Joint meeting with the E. Midlands Branch of the I.Mech.E.) Assembly Hse, Norwich. 7.30 p.m.

I.E.E. (E. Midlands). "Research on the Performance of High-Voltage Insulators in Polluted Atmospheres," J. S. Forrest, P. J. Lambeth and D. F. Oakeshott. E.M.E.B., Church Croft, Horninglow St, Burton-on-Trent. 6.30 p.m.

I.E.E. (N. Midlands). Hunter Memorial Lecture: "The Application of Electronics to the Electricity Supply Industry," J. S. Forrest. Leeds and County Conservative Club, South Parade, Leeds 1. 6.30 p.m.

I.E.E. (N.W. Utilisation Group). "A Survey of Street Lighting and Its Future," W. R. Stevens and H. M. Ferguson. Engineers' Club, Albert Sq, Manchester. 6.15 p.m.

I.E.E. (Southern). "Stereophonic Transmission and Reproduction," P. M. Thompson. The University, Southampton. 6.30 p.m.

I.E.E. (S.E. Scotland). "A Visit to South Africa," Professor M. G. Say. Carlton Hotel, Edinburgh. 7 p.m.

INSTITUTION OF PLANT ENGINEERS. "Standards in Plant Engineering." Dr E. L. Diamond. Royal Society of Arts, John Adam St, W.C.2. 7 p.m.

INSTITUTION OF PLANT ENGINEERS (Peterborough). "National Dialling Systems," Lt-Col W. E. Gill. White Lion Hotel, Church St. 7.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (Coventry Graduates). "Automatic Equipment in the Metal Finishing Industry," S. H. Grindrod. Courtaulds' Lecture Theatre, Lockhurst La. 7.30 p.m.

A.S.E.E. (Leicester). "Control Centres for Modern Industry," H. B. Davies. Westcotes Constitutional Club, Wilberforce Rd. 7.30 p.m.

A.S.E.E. (Reading and Districts). "Refrigeration." "Marquis of Lorne," Friar St. 7.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS. "Tunnel Diodes." Institute of Physics, 47 Belgrave Sq, S.W.1. 2.15 p.m.

WEDNESDAY, 8 FEB.

I.E.E. (Electronics and Measurement Sections). Dinner-dance. Café Royal. 7.30 p.m.

I.E.E. (N. Lancs). "A Survey of Street Lighting and Its Future," W. R. Stevens and H. M. Ferguson. N.W.E.B. Demonstration Theatre, Lancaster Rd, Lancaster. 7.30 p.m.

I.E.E. (N.W. Electronics and Communications Group). "Microminiaturisation," L. J. Ward. Engineers' Club, Albert Sq, Manchester. 6.15 p.m.

I.E.E. (S.W. Scotland). "Energy Resources of Scotland," J. Henderson and C. L. C. Allan. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 6 p.m.

I.E.E. (Oxford). "Development of Eurovision," M. J. Pulling. S.E.B. District Office, 37 George St. 7 p.m.

I.E.E. (S. Midland Graduates and Students). "Electro-Physiology," D. Lane. James Watt Memorial Institute, Birmingham. 6.30 p.m.

WOMEN'S ENGINEERING SOCIETY (London). "Space Flight." "Hope House," 45 Great Peter St, Westminster, S.W.1. 7 p.m.

INSTITUTION OF MECHANICAL ENGINEERS. "The Influence of Measuring Force, Stylus Radius and Surface Finish on the Accuracy of Measurement of Work Pieces by a Comparator," L. W. Nickols and T. R. J. Oakley: and "An Investigation into the Accuracy of Industrial Measurement of Sizes Between 0·02 and 5 in.", P. W. Harrison. Birdcage Walk, S.W.1. 6 p.m.

NEWPORT AND DISTRICT ELECTRIC CLUB. "Architecture and the Electrical Engineer," A. J. Gordon. King's Head Hotel, Newport, Mon. 6.30 p.m.

INSTITUTION OF PLANT ENGINEERS (Western). "Foundry Development." D. Potts. Grand Hotel, Broad St, Bristol. 7.15 p.m.

A.S.E.E. (Birmingham). "Panelec Floor Warming and Ancillary Equipment," K. W. Ballamy. Exchange and Eng. Centre, Stephenson Pl. 7.30 p.m.

A.S.E.E. (Luton). "Variable Speed a.c. Motors," J. C. Bone. College of Technology, Park Sq. 8.15 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Computer Group). "Perseus, a Medium-scale Data Processing System," G. Emery. London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 5.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (S. Wales). "The Principles of Analogue to Digital Computer Conversion," J. L. W. Churchill. Welsh College of Advanced Technology, Cardiff. 6.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Scottish). "Measuring Stability and Spurious Modulation Spectra of High Quality Oscillators," A. L. Whitwell. Dept. of Natural Philosophy, University, Edinburgh. 7 p.m.

THURSDAY, 9 FEB.

I.E.E. (Utilisation Section). "Some Notes on the Electrical Requirements of General Cargo Docks," E. R. Radway. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Cambridge Electronics and Measurement Group). "The Ultrasonic Microscope," C. N. Smyth. Cavendish Laboratory, Cambridge. 8 p.m.

I.E.E. (N. Scotland). "Subscriber Trunk Dialling," D. A. Barron. Electrical Engineering Dept., Queen's College, Dundee. 7 p.m.

I.E.E. (W. Wales). "Discrimination Between h.r.c. Fuses," E. Jacks. Conference Room, S.W.E.B., The Kingsway, Swansea. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Cheltenham). "Instrumentation at Berkeley Power Station," F. J. Benstead. Belle Vue Hotel. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Liverpool). "Flame Failure Equipment," A. M. Lock. M.A.N.W.E.B. Industrial Development Centre. 7 p.m.

I.E.S. (Manchester). "Floodlighting of Liverpool Cathedral," C. C. Smith. Demonstration Theatre of N.W.E.B., Town Hall Extension. 6 p.m.

FRIDAY, 10 FEB.

I.E.E. (E. Anglian). Annual dinner-dance. Dorothy Restaurant, Cambridge. 7.30 p.m.

I.E.E. (N. Staffs). "Planning and Installation of the Sound Broadcasting Headquarters for the B.B.C.'s Overseas and European Services," F. Axon and O. H. Barron. North Staffs College of Technology, Stoke-on-Trent. 7 p.m.

I.E.E. (N. Scotland). "Subscriber Trunk Dialling," D. A. Barron. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

I.E.E. (Southern). "Thermo-Nuclear Physics," T. E. Allibone. S.E.B. Showrooms, Newport, Lo.W. 6.30 p.m.

E.P.E.A. (Meter Engineers' Technical Group). "Some Second Thoughts," L. B. S. Golds. Caxton Hall, Westminster, S.W.1. 6.30 p.m.

I.E.E. (N.E. Graduates and Students). "Performance and Design of Artificial Transmission Line with Distributed Parameters," J. P. Patel. Grey Hall, King's College, Newcastle upon Tyne. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Midlands). "Process Control," R. M. J. Withers. Lecture Theatre of the Byng Kendrick Suite at the Gosta Green College of Technology, Aston St. Birmingham. 7 p.m.

JUNIOR INSTITUTION OF ENGINEERS. "The Detection of Radiation," G. Ballard. Pepys Hse, 14 Rochester Row, S.W.1. 7 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (Eastern). "Further Training of University Graduates with Particular Reference to Production Engineering," S. H. Potter. Britannia Wks Canteen, Davey Paxman and Co., Colchester. 7.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (S. Western). "Materials Problems in Nuclear Energy," Dr P. Murray. Wheatstone Hall, Brunswick Rd, Gloucester. 7.30 p.m.

MONDAY, 13 FEB.

I.E.E. Discussion: "The Road to Corporate Membership: What is the Responsible Experience Required?" (Joint meeting with the London Graduates and Students.) Savoy Pl, W.C.2. 6 p.m.

I.E.E. (N. Eastern). "The Protection of High-Voltage Insulators from Power Arc Damage," A. E. Guile. Neville Hall, Newcastle upon Tyne. 6.30 p.m.

I.E.E. (N. Western). Discussion: "Laboratory Work for the Institution Examinations." Engineers' Club, Albert Sq, Manchester. 6.15 p.m.

I.E.E. (S. Midlands Supply and Utilisation Group). "The Application of Low-Pressure Resins to Some High-Voltage Switchgear Designs," T. R. Manley, K. Rothwell and W. Gray. College of Advanced Technology, Gosta Green, Birmingham. 6 p.m.

I.E.E. (Scottish Electronics and Measurements Group). "Development of the Formulae of Electromagnetism in the M.K.S. System," P. Vigoureux. Royal College of Science and Technology, Glasgow. 6 p.m.

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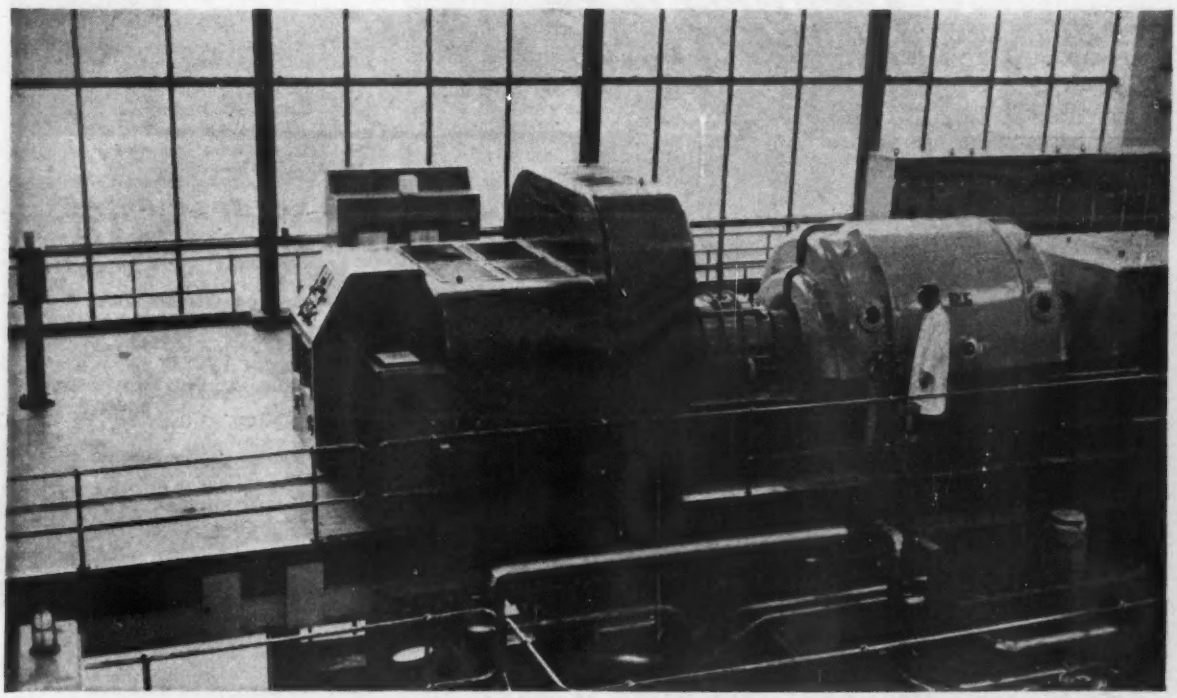
3,000 p.s.i.g. turbo-alternator for the Steel Company of Wales Margam 'B' power station.

The highest pressure turbo-alternator built in Britain has been generating power at Margam since May 1960. The turbine is designed to take steam at 3,000 p.s.i.g. at 1,050°F, and to exhaust at 625 p.s.i.g. The turbine speed of 9,500 r.p.m. is geared down to 3,000 r.p.m. at the alternator, which generates 9.25 MW at 11,500 volts, with a power factor of 0.7 lagging. The set was built to Brown-Boveri designs in our Hartlepool works, where we manufacture turbines and alternators for public and industrial electricity supply. In addition, we manufacture most items of power station plant, including water tube and Economic boilers, condensers, feed heaters, and 'Deptford' rotary water strainers.



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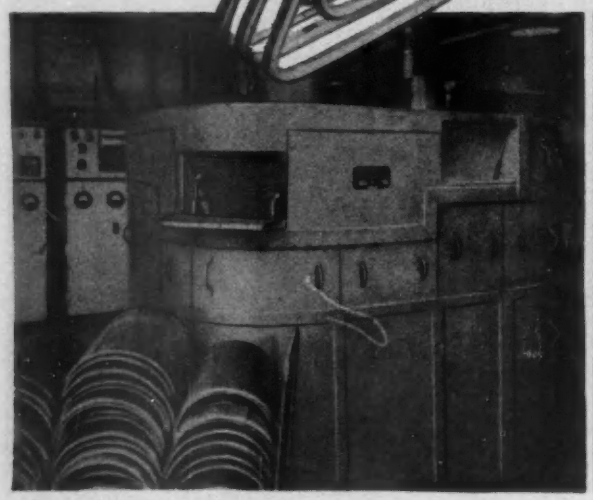

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CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

CITY OF BELFAST ELECTRICITY DEPARTMENT

TENDERS are invited for the Supply, Delivery and Erection of:

33/6·6 kV 12,500 kVA Step-down Transformers.

Form of Tender and Specification (No. W.187), in duplicate, may be obtained at the Electricity Department, East Bridge St, Belfast 1, on payment of a deposit of £2 2s, which amount will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the contract documents may be obtained at £1 1s each, which sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each Tender (original only), in sealed envelope marked "Tender for 33/6·6 kV 12,500 kVA Step-down Transformers, Electricity Committee" and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 3 March, 1961.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

P.O. Box 234,
City Hall, Belfast 1. (T 513)

COUNTY BOROUGH OF CROYDON

To Electrical Contractors

TENDERS are invited for installing power plug sockets and other electrical work in 720 pre-war Council houses (divided into three groups) on the Mitcham Rd estate.

Further particulars and tender forms obtainable from the Housing Manager, 71 Park La, Croydon. Closing date for tenders: 17 Feb., 1961.

E. TABERNER,
Town Clerk.
(T 514)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Sale by Tender of Miscellaneous Plant

THE Board have for disposal and invite tenders for the purchase of one 500 kW 6,600/460-230 V 3 W D.C. Rotary Convertor with transformer and starting panel; one 500 kW four-cubicle 6,600/460-230 V steel bulb Mercury Rectifier with transformer, D.C. switchboard, contactor, etc.; one 50 V and one 225 V Battery Set complete with charging units.

Particulars as to where they may be inspected and Forms of Tender, on which offers must be submitted, may be obtained on application to the Manager, No. 4 Sub-Area, Merseyside and North Wales Electricity Board, Electricity Hse, Rhostyllen, Wrexham. Tenders must be returned in a sealed envelope, as provided, so as to arrive not later than noon on Wednesday, 8 Feb., 1961.

The equipment is offered for sale without guarantee as to its condition, and the Board do not bind themselves to accept the highest or any tender and reserve the right to accept the whole or any part of any tender.

M. M. PARKER,
Secretary.
January, 1961. (T 512)

APPOINTMENTS VACANT

SOUTH EASTERN ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER
(CONSTRUCTION)

SALARY £1,440/£1,610 per annum under N.J.B. Schedule B, Grade AX5. Superannuable. The duties attaching to this position require an experienced engineer, preferably a Corporate or Graduate Member of the Institution of Electrical Engineers. The person appointed will be required to assist in the design and construction of substations up to 33 kV, and the preparation of specifications for plant and materials, including underground cable works and overhead lines. His duties will also embrace plant inspection and associated engineering problems whilst maintaining close liaison with the field engineers.

Applications, quoting ET and naming two referees, on forms from the Engineer-in-Chief, Seeboard, 10 Queen's Gdns, Hove 3, Sussex, by 15 Feb., 1961.

SECOND ASSISTANT ENGINEER
(CONSTRUCTION)
CROYDON AND WEST KENT HEADQUARTERS

Salary under N.J.B. Class K, Grade 7, £1,400 x £30—£1,550 p.a. including London Allowance. Superannuable. Candidates should be either Corporate or Graduate Members of the Institution of Electrical Engineers and have a wide experience in the construction and commissioning of substations, overhead and underground distribution systems up to and including 33 kV.

Applications, quoting ET and naming two referees, on forms from the Croydon and West Kent Manager, Seeboard, Electric Hse, Wellesley Rd, Croydon, Surrey, by 15 Feb., 1961.

CARTOGRAPHIC DRAUGHTSMAN
CROYDON AND PURLEY DISTRICT

Salary £740 x £25—£815 per annum including London Allowance under N.J.C. Grade 2. Superannuable. Applicants should have a good general education, experience in a distribution drawing office, and be fully conversant with mains recording and preparation of system diagrams, etc.

Applications, quoting ET and naming two referees, on forms from District Manager, Seeboard, Electric Hse, Wellesley Rd, Croydon, by 15 Feb., 1961.

GEORGE WRAY,
Secretary.
(T 506)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

NORTHFLEET POWER STATION
GENERAL ASSISTANT ENGINEER
Vacancy No. 32/61.

REQUIRED to assist the Efficiency Engineer with plant investigation, records, etc. Possession of the H.N.C. would be an advantage.

Salary within the range £1,015/£1,140 per annum, including London Allowance.

Applications giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Northfleet Power Station, Crete Hall Rd, Northfleet, Kent, to arrive by 14 Feb.

W. H. DUNKLEY,
Divisional Controller.
(T 495)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

GRADE 10 ENGINEER
MARCHWOOD GENERATING STATION
SEC/3.131

THE person appointed may be required to undertake shift operational work, control room duties, assist on maintenance work or perform general station duties. Previous experience of modern generating plant is desirable.

Applicants should have had a sound technical training and possess qualifications leading to Corporate Membership of an appropriate professional institution or hold equivalent qualifications.

Salary: N.J.B. Scale 10, Grade L.10, £1,190/£1,325.

Special application forms, obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 13 Feb., 1961.

ASSISTANT ENGINEER
(MAINTENANCE PLANNING OFFICE)
MARCHWOOD GENERATING STATION
SEC/3.132

Applications are invited from suitably qualified and experienced Engineers to take charge of the Maintenance Planning Office under the Maintenance Superintendent. The duties include the planning of the day-to-day maintenance and co-ordination of the work of the Mechanical, Electrical, Instrument and Building Maintenance Sections. The successful candidate will be responsible for the implementation of routine maintenance and assisting with the detailed planning and programming of major plant overhauls.

Salary: N.J.B. Scale 11, Grade L.9, £1,275/£1,410

Special application forms, obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 15 Feb., 1961.

SHIFT CONTROL ENGINEER
EARLEY GENERATING STATION
SEC/3.133

Applicants should have had appropriate experience in a modern generating station with high operating temperatures and pressures. Manufacturing works experience will be an advantage.

Preference will be given to those possessing technical qualifications leading to Corporate Membership of a recognised professional engineering institution or those holding appropriate equivalent qualifications.

Salary: N.J.B. Scale 6, Grade G.10, £890/£1,015.

Special application forms obtainable only from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 15 Feb., 1961. (T 501)

THE NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the appointment of

DISTRICT COMMERCIAL ENGINEER
CONSETT DISTRICT

with location at Stanley Service Centre.

Applicants should be suitably qualified engineers and have experience in the utilisation of electrical energy in commercial and domestic premises, knowledge of installation work and be conversant with tariffs, sales and all aspects of consumer service.

Duties of the post include responsibility for commercial administration of the District, control of two service centres, contracting and consumer service arrangements.

Salary: Schedule A, Class F, Grade 3, i.e., £1,350/£1,500 per annum. N.J.B. conditions of employment.

Applications stating age, qualifications and experience to be received by the Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne 1, within ten days of the appearance of this advertisement. (T 508)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

EAST ANGLIAN REGIONAL HOSPITAL BOARD

Regional Engineer's Department

(1) ENGINEERING MAIN GRADE (MECHANICAL)

(a) Corporate members, Inst.Mech.E. Salary: £1,160/£1,600.

(b) Corporate members, Inst.H. and V.E. Salary: £910/£1,400.

(c) Graduate members, Inst.Mech.E. Salary: £910/£1,205.

(2) ENGINEERING MAIN GRADE (ELECTRICAL)

Graduate members, Inst.E.E. Salary: £910/£1,205.

Candidates appointed will be engaged on design of central heating and hot water systems, air conditioning equipment, etc., including design of steam boiler plant, laundry installations, etc.; or electric lighting and power installations, radio and telephone installations and electronics in relation to hospital engineering projects. Experience in estimating and in preparation of specifications desirable.

Candidates appointed under 1(a) or 1(b) will be responsible for small design team for all aspects of mechanical engineering services in large hospital building projects.

Graduate members of the Institutions of Mechanical and Electrical Engineers automatically proceed by increments to maximum of Grade (£1,600) upon being admitted to corporate membership.

(3) ENGINEERING DRAUGHTSMEN (MECHANICAL AND ELECTRICAL)

Grade I, salary: £1,030/£1,250.
Grade II, salary: £870/£1,010.
Grade III, salary: £550/£850.

Candidates for I and II should preferably have H.N.C. or O.N.C. and be experienced in the design of engineering works and the preparation of tender drawings and specifications under supervision.

Candidates for III should have had minimum of three years' practical training including site or workshop experience. Knowledge of engineering drawing and estimating an advantage.

Applications stating age, qualifications, experience and details of present position with names of three referees to Secretary of Board, 117 Chesterton Rd, Cambridge, by 3 March, 1961. (T 496)

CITY OF SALISBURY — ELECTRICITY DEPARTMENT

VACANCY FOR ELECTRICAL ENGINEER (PROTECTION)

SALARY Scale: £1,025 x £102 10s—£1,332 10s x £76 17s 6d—£1,563 2s 6d x £51 5s—£1,768 2s 6d per annum.

Applications are invited for the fixed establishment post of Electrical Engineer (Protection) in the Salisbury Municipal Electricity Department on the scale: £1,025 x £102 10s—£1,332 10s x £76 17s 6d—£1,563 2s 6d x £51 5s—£1,768 2s 6d per annum. No allowances are payable.

Commencing salary is based on qualifications and experience. There is a barrier at £1,563 2s 6d per annum, above which no engineer can rise without being a corporate member of the British Institution of Electrical Engineers, and the maximum entry point into the grade is £1,614 7s 6d per annum.

Candidates must be graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree, and have had not less than five years' experience in general protection work.

Consideration, however, will be given to applicants who have not the above qualifications but who have had extensive practical experience. The salary scale applicable in such instance will be £1,568 5s x £51 5s—£1,722 per annum, commencing salary being at the minimum of the grade.

The successful applicant will work under the direction of the Test Engineer in the Consumers' Engineer's Section and his duties will comprise mainly:

1. Design and commissioning of all types of protection schemes on generators, feeders, motors, transformers and other types of electrical equipment.

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2. Determination of relay settings and the calculation of fault currents over the system. Supervision of staff engaged in the maintenance and repair of all relays and instruments associated with protection schemes.

The Department has an extensive supervisory indication, control and telemetering scheme and experience with similar equipment is desirable. Experience with electronic equipment would be considered an advantage.

The appointment will be subject to the City Council's Service and Leave Regulations. The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months and, if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities Joint Pension and Widows' and Orphans' Fund. He must also be able to comply with the requirements of the Federal Immigration Authorities.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital state should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Messrs Merz and McLellan, Carliol Hse, Newcastle upon Tyne 1, quoting reference PN, to whom applications must be submitted on or before 17 Feb., 1961. (T 461)

FEDERAL GOVERNMENT OF NIGERIA

require

ELECTRICAL SUPERINTENDENT (P.W.D.)

AN Electrical Superintendent is required by the Works Division of the Federal Ministry of Works and Surveys to supervise the work of electrical contractors and maintain electrical installations in Government buildings, hospitals, staff quarters, etc., under the direction of the Senior Electrical Engineer. The officer appointed will also be required to demonstrate to contractors' staff or other workmen modern methods of installations and be prepared to pass on specialised knowledge to them. Candidates, who should be between the ages of 28 and 50, must have successfully completed an appropriate five years' apprenticeship, had a minimum of two years' responsible experience in electrical contracting work in a supervisory capacity and considerable experience in re-winding of fractional horse-power and large motors. The possesion of a City and Guilds Certificate in Electrical Installation work would be an advantage and it is desirable to have a knowledge of the electrical maintenance of air-conditioning and oil engine stand-by generating plant.

Appointment on contract for one tour of 15 to 18 months in the first instance. Salary according to age and experience, £1,056 p.a. to £1,692 p.a. (including Inducement Addition), plus gratuity of £100 to £150 p.a. for satisfactory service. An outfit allowance of £60 is paid on salaries not exceeding £1,740.

Free passages for officer and wife. Children's allowances while separated. Home leave on full pay. Income Tax at low local rate. Rent at low cost.

Candidates should write for further particulars, stating age, qualifications and experience, to the Recruitment Attache, Office of the High Commissioner for Nigeria, Nigeria Hse, 9 Northumberland Ave, London W.C.2, quoting V.13/2.

(T 475)

UNIVERSITY OF WESTERN AUSTRALIA

SENIOR LECTURESHIP IN ELECTRICAL ENGINEERING

APPLICATIONS are invited for appointment to the above-named position for which the salary range is £A2,450 x £100—£2,950 per annum with superannuation similar to F.S.S.U. Preference will be given to candidates with an interest in Electrical Machines, Electrical Measurements or Telecommunications.

The Department of Electrical Engineering is housed in a well-equipped new building and there are excellent facilities for research.

The appointee will be expected to take up duty as soon as possible.

It is important that intending applicants obtain details of the procedure to be followed in applying for the post and a copy of the Conditions of Appointment, before submitting their applications. This information is available from the Secretary, Association of Universities of the British Commonwealth, 36 Gordon Sq, London W.C.1.

Applications close, in Australia and London, on 31 March, 1961. (T 488)

CENTRAL ELECTRICITY GENERATING BOARD

Southern, South Western and South Wales Region

Research and Development Department

ELECTRICAL ENGINEERS
Regional Vacancy No. 108.

APPLICATIONS are invited for two posts based at new laboratories at Portishead, ten miles west of Bristol. The work involves laboratory and site investigations of technical problems occurring on the Board's generation and transmission systems and requires an original outlook and the ability to apply fundamental principles.

Applicants should be experienced in one or more of the following fields: power generation, power transmission, electronic design, electro-chemical corrosion investigations, acoustic measurements. Research experience is desirable. Applicants should preferably hold qualifications leading to corporate membership of a senior professional institution, although H.N.C. or equivalent may be acceptable.

The salaries for the posts will be within the range £1,115/£1,410.

Successful candidates can be assured of excellent career prospects, based entirely on merit, and of being engaged on forward looking work. Staff are given every facility to publish technical and scientific papers. Assistance may, under certain conditions, be given with housing.

Applications on Forms AE6/ACT, obtainable from the Regional Secretary, Central Electricity Generating Board, Southern, South Western and South Wales Region, 1 Eaton Cres, Clifton, Bristol 8, should be returned so as to reach him by not later than Monday, 13 Feb., 1961. (T 493)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

MAINTENANCE ENGINEER (ELECTRICAL)

REQUIRED at Nechells "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.5, £1,535/£1,720 per annum.

A sound technical training and practical experience in electrical maintenance in a modern power station is required, and the possession of an appropriate technical qualification will be an advantage.

Apply, quoting Vacancy No. 21/61 MD on form AE6, available from the Station Superintendent, Nechells Power Station, Aston Church Rd, Nechells, Birmingham 7, to whom they should be returned to arrive not later than 13 Feb., 1961. (T 497)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

PLANT SHIFT CONTROL ENGINEER
DRAKELOW "B" POWER STATION
Vacancy No. 12/61

APPLICATIONS are invited for the position of Plant Shift Control Engineer at Drakelow "B" Power Station, near Burton-on-Trent, Staffs.

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience.

Technical qualifications to Higher National Standard desirable.

Salary will be in accordance with Class L, Grade 10 (£1,190/£1,325 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 10 Feb., 1961.

STATION SHIFT CONTROL ENGINEER
LEICESTER POWER STATION
Vacancy No. 15/61

Applications are invited for the position of Station Shift Control Engineer at Leicester Power Station, Rawdykes Rd, Leicester.

Candidates should be experienced in control room operation. A Higher National Certificate would be an advantage.

Salary will be in accordance with Class G, Grade 10 (£890/£1,015), per annum of the National Joint Board Agreement, plus shift allowance.

Closing date for receipt of applications: 17 Feb., 1961.

GENERAL ASSISTANT ENGINEER
DERBY POWER STATION
Vacancy No. 17/61

Applications are invited for the position of General Assistant Engineer at Derby Power Station, Full St, Derby.

Candidates should be suitably qualified young men who are interested in power station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend upon qualifications and knowledge, and will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 17 Feb., 1961.

SHIFT CHARGE ENGINEER
BURTON-ON-TRENT POWER STATION
Vacancy No. 18/61

Applications are invited for the position of Shift Charge Engineer at Burton-on-Trent Power Station, Wetmore Rd, Burton-on-Trent, Staffs.

Sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Salary will be in accordance with Class E, Grade 7 (£965/£1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 17 Feb., 1961.

FIRST ASSISTANT STATION CHEMIST
LEICESTER POWER STATION
Vacancy No. 19/61

Applications are invited for the position of First Assistant Station Chemist at Leicester Power Station, Rawdykes Rd, Leicester.

Previous experience in a power station laboratory is essential and candidates should, at least, hold the H.N.C. in Chemistry. Candidates must be familiar with methods of sampling and analysis of coal, oil and water, and with the interpretation and application of analytical results.

Salary will be in accordance with Class G, Grade 9 (£965/£1,090 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 17 Feb., 1961.

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PLANNING ENGINEER
WILLINGTON "A" AND "B" POWER STATION
Vacancy No. 20/61

Applications are invited for the position of Planning Engineer at Willington "A" and "B" Power Station, P.O. Box 27, Derby.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional institute or who hold qualifications leading to such membership, and candidates should have a clear and objective approach to power station planning problems.

Salary will be in accordance with Class M, Grade 6 (£1,650/£1,830 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 17 Feb., 1961.

EFFICIENCY ENGINEER
WILLINGTON "A" and "B" POWER STATION
Vacancy No. 21/61

Applications are invited for the position of Efficiency Engineer at Willington "A" and "B" Power Station, P.O. Box 27, Derby.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 6 (£1,650/£1,830 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 17 Feb., 1961.

SECOND ASSISTANT STATION CHEMIST
LEICESTER POWER STATION
Vacancy No. 22/61

Applications are invited for the position of Second Assistant Station Chemist at Leicester Power Station, Rawdykes Rd, Leicester.

Experience of analyses of fuel, water and oils is desirable and educational standard up to Higher National Certificate would be an advantage.

Salary will be in accordance with Class G, Grade 11 (£825/£940 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 17 Feb., 1961.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned, and should be returned to him by the date stated.

O. S. WOODS,
Divisional Controller.

27 Jan., 1961. (T 511)

THE EAST MIDLANDS ELECTRICITY BOARD

Leicestershire & Warwickshire Sub-Area

Re-Advertised Vacancy No. 129/60
FOURTH ASSISTANT ENGINEER

SALARY: N.J.B. Class K, Grade 12, £965/£1,090 per annum.

Duties include H.V. network calculations, fault analysis, reporting, and generally to assist the Operations and Maintenance Engineer. Ability to drive a car would be an advantage and the successful applicant will be required to reside in or near Hinckley.

Applications should be forwarded to the Manager, Leicestershire and Warwickshire Sub-Area, Upper Bond St, Hinckley, Leics., within 14 days of the date of this advertisement.

Nottingham Sub-Area

Vacancy No. 12/61
FOURTH ASSISTANT DISTRICT ENGINEER

Salary: N.J.B. Class F, Grade 10, £825/£940 per annum.

The duties of this post will be to assist in the construction, operation and maintenance of distribution systems of all voltages up to 11 kV.

Applications should be forwarded to the Manager, Nottingham Sub-Area, 35-39 Carrington St, Nottingham, within 14 days of the date of this advertisement.

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Area Board Headquarters

Vacancy No. 13/61
THIRD ASSISTANT ENGINEER
(OPERATIONS)

Salary: N.J.B. Class BX, Grade 8, £1,105/£1,410 per annum. The starting salary will depend on the experience and qualifications of the successful candidate.

Applicants should have a sound knowledge of the operation and maintenance of underground and overhead distribution systems and associated equipment up to and including 33 kV. They should be familiar with the Statutory Regulations and Safety Rules concerning the construction, operation and maintenance of such systems, and be able to write concise and accurate reports.

Vacancy No. 14/61
THIRD ASSISTANT ENGINEER
(CONSTRUCTION)

Salary: N.J.B. Class BX, Grade 8, £1,105/£1,410 per annum. The starting salary will depend on the experience and qualifications of the successful candidate.

Applicants should be familiar with the installation of electrical plant, including transformers, switchgear, etc., and all ancillary equipment up to and including 33 kV. Ability to interpret and check switchgear and other manufacturers' drawings is essential. Experience in carrying out underground cable installations and overhead line construction, together with the erection of outdoor substations is also required.

Vacancy No. 15/61
FOURTH ASSISTANT ENGINEER
(TECHNICAL)

Salary: N.J.B. Class BX, Grade 10, £935/£1,245 per annum, or Grade 9, £1,005/£1,325 per annum, depending on the experience and qualifications of the successful candidate.

The duties of the post include assisting in the work of the Section, particularly in fault analysis and reports dealing with the assessment of plant performance and tests on various types of equipment.

Applications for the above vacancies should be forwarded to the Chief Engineer, The East Midlands Electricity Board, Mapperley Hall, Lucknow Ave, Nottingham, within 14 days of the date of this advertisement. (T 504)

CENTRAL ELECTRICITY GENERATING BOARD

LABORATORY TECHNICIANS

REQUIRED in the High Voltage Division at the Research Laboratories, Leatherhead, Surrey.

The work covered by this Division, which is shortly to be housed in a new high voltage laboratory, includes research on high voltage transmission and fundamental studies of insulation, etc., and technicians are required to construct apparatus and test rigs, and in some cases prototype measuring or test instruments. A certain amount of electronic work is involved.

Applicants should have served a recognised period of training and have considerable practical experience and ability, preferably in laboratory or development work. They should be able to work with the minimum of supervision and, after discussing problems with scientific staff, to give practical interpretation to their needs by constructing equipment meeting the various requirements.

Possession of an O.N.C. or equivalent qualification in electrical engineering would be an advantage.

The appointments, which are permanent and pensionable, carry staff status and are based on a 38-hour five-day week, with annual leave rising to a maximum of four weeks. Salaries within the range £650/£940 p.a.

Applications stating age, qualifications, experience, present position and salary, to the Appointments Officer, 24-30 Holborn, London E.C.1, by 21 Feb. Envelopes should be marked "Confidential Ref. ET/44." (T 519)

EASTERN ELECTRICITY BOARD

Essex Sub-Area

NORTH ESSEX DISTRICT
THIRD ASSISTANT ENGINEER
14/61.R.

CANDIDATES should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary: N.J.B. Class F, Grade 9 (£890/£1,015).

Living accommodation will be available.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply by letter to J. C. Horrell, M.I.E.E., Manager, North Essex District, Eastern Electricity Board, Cressing Rd, Braintree, Essex, by 17 Feb., 1961. (T 499)

FALKLAND ISLANDS DEPENDANCIES SURVEY

DIESEL MECHANIC FOR ANTARCTICA

DIESEL MECHANIC urgently required for service in the Antarctic for two years. Salary is at basic rate of £500 a year. Whilst in Antarctic everything is provided free of charge including clothing, cigarettes, etc. Generous cash payment on completion of service.

Candidates, between 20 and 30 years of age and preferably single, must be capable of maintaining small petrol or diesel generating plant and be able to install and maintain elementary electrical circuits.

Successful candidate will be required to leave immediately.

Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/50974/EE. (T 510)

GHANA CIVIL SERVICE

VACANCIES EXIST in the ELECTRICITY DIVISION for

(a) MECHANICAL ENGINEERS

DUTIES: Assist Chief Electrical Engineer in the efficient operation and maintenance of generating plant in a number of electricity undertakings and the planning and installation of extensions to plant.

Qualifications: Candidates must either (i) hold a B.Sc.(Eng.) degree or other recognised engineering degree, i.e., a degree giving exemption from Parts I, II and III of the Institution of Mechanical Engineers, and have had two years' subsequent professional experience; or (ii) have passed Parts I, II and III of the Institution's examination, provided they are not less than 23 years of age. A thorough knowledge and experience of the erection, operation and maintenance of compression ignition oil engines up to 1,200 h.p. driving three-phase a.c. generators is essential. Salary in range £1,080/£2,080 p.a. according to qualifications and experience.

(b) ELECTRICAL SUPERINTENDENT (DEVELOPMENT)

Duties: Candidates must be capable of exercising technical, financial and administrative control of electricity supplies in small stations.

Qualifications: Good general education; at least 29 years old; at least five years' apprenticeship in mechanical or electrical engineering; thorough practical knowledge and experience in supervisory capacity either of alternating current overhead and underground transmission and distribution, substations, transformers and switchgear up to 11,000 volts and of wiring; or of compression ignition oil engines generating between 100 and 1,500 kilowatts. Salary in range £1,040/£1,280 p.a. according to qualifications and experience.

Appointments on contract for two to three tours each of 15-18 months. Gratuity £150 p.a. Free passages for officer, wife and up to three children under 18 years. Also educational allowance of £100 p.a. per child for up to three children under 18 years when not resident in Ghana and attending full-time course. Accommodation at low rental. Interest-free advance for car and maintenance allowance may be granted.

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Generous leave on full pay. Income tax at low local rates.

GENERAL: Applications giving age, qualifications, experience, present position and salary should be made in writing to the DIRECTOR OF RECRUITMENT, GHANA HIGH COMMISSION, 248 TOTTENHAM COURT RD, LONDON W.1. (T 521)

GOVERNMENT OF QATAR

State Electricity Department

THE Government of Qatar in the Arabian Gulf has a vacancy for a

POWER HOUSE MAINTENANCE ENGINEER

in the State Electricity Department.

There are two existing Power Stations (No. 1) Comprising seven diesel alternator sets of 200-540 kW; (No. 2) comprising five diesel alternator sets of 2,600 kW. A new Steam Power Station with an initial installation of 2-15,000 kW Turbo-alternator sets is under construction.

Applicants between 40-45 years of age must have served a Mechanical Engineering apprenticeship and have studied up to the Higher National Certificate and have had considerable experience of the erection, operation and maintenance of diesel engine alternator sets up to 4,500 b.h.p. and all ancillary equipments with experience in a modern diesel Power Station and its associated problems. Similar experience with modern steam plant is also desirable.

Appointee may be required to deputise for Power Station Superintendent during his absence of leave or illness.

Salary starting at Rs. 2,000/- per Arabic month (equivalent to approximately £1,950 per year) with annual increments of Rs. 100/- per month up to a maximum salary of Rs. 2,300/- per month.

Contract offered is for three or five years subject to six months' probationary period. Gratuity payable on completion of Contract. Leave: six days for each month on duty, taken annually. Free passages, furnished accommodation, fuel, light, water and medical treatment. No income tax.

Applications endorsed "Power House Maintenance Engineer, Qatar," accompanied by full personal particulars including age, education, qualifications, experience, religion and past employment, the names of three referees and a recent dated photograph, should be made in writing, in duplicate, within 14 days of the date of this advertisement to:

PREECE, CARDEW and RIDER,
8-12 Queen Anne's Gate,
Westminster, S.W.1. (T 503)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Re-advertisement.
Vacancy No. 24/ET/61

APPLICATIONS invited for the superannuable N.J.B. appointment of

STATION SHIFT CONTROL ENGINEER

at LLYNFI POWER STATION, near Bridgend, Glam.

Salary: Schedule A, Class G, Grade 10, Scale 6 (£890/£1,015 per annum) plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualifications and have had experience in a modern power station.

Previous applicants need not re-apply.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 13 Feb., 1961. (T 500)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER
(GLOUCESTER)

Experience necessary in the construction, operation and maintenance of large H.V. and M.V. underground and overhead distribution systems. Technical qualifications desirable. Salary: £890/£1,015 per annum (N.J.B. Grade F.9). Apply, by letter, within 14 days, stating age, experience, present position and salary to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

North Staffs. Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER
(NEWCASTLE)

Duties include the construction, operation and maintenance of H.V. and M.V. mains and substations, and applicants should have had experience in the planning of system reinforcements and mains extensions. Salary: £890/£1,015 per annum (N.J.B. Grade F.9). Apply, by letter, within ten days, stating age, experience, present position and salary to Mr C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

F. W. CATER,
Secretary.
(T 486)

SOUTHERN ELECTRICITY BOARD

ASSISTANT PLANNING ENGINEER (MAINS)

SUB-AREA Engineering Department of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class M, Grade 7 (£1,535/£1,720 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist the Sub-Area Planning Engineer with the preparation and examination of H.V. and L.V. schemes for the development and reinforcement of new and existing systems operating at voltages of 33 kV and below, and with the design and specification of underground and overhead mains for such systems. The applicant must be well qualified, both technically and by experience, and be fully acquainted with all Statutory requirements.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks ,and returned to him, quoting Z.1307, not later than 13 Feb., 1961.

FOURTH ASSISTANT ENGINEER (METERS)

Sub-Area Engineering Department of No. 1 (Southall) Sub-Area, located at Waterloo Rd, Uxbridge. Salary: N.J.B. Class M, Grade 13 (£1,090/£1,215 per annum, including London Allowance). N.J.B. Conditions of Service.

Applicants must have had experience in a Class "A" Meter Testing Sation and must be capable of supervising and co-ordinating the testing work in the department.

Applications on forms obtainable from the Sub-Area Secretary, 2-6 Windmill La, Southall, Middlesex, and returned to him, quoting Z.1306, not later than 13 Feb., 1961.

DEMONSTRATOR

Reading District of No. 2 (Newbury) Sub-Area. Salary: N.J.C. Grade 1, (£600/£700 per annum). N.J.C. Conditions of Service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1309, not later than 13 Feb., 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (T 502)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:

THIRD ASSISTANT ENGINEER (PLANNING)
BRISTOL GROUP

Salary according to Class L, Grade 9, Salary Scale 11, £1,275/£1,410 per annum, of the N.J.B. Agreement.

The successful candidate will work in the technical and planning section and will be largely concerned with the detailed specification of 33 kV plant, and co-ordination and progressing of plant technical requirements. He will also assist in the commissioning of 33 kV substations.

Candidates should have had a broad technical training and experience of construction and operation of systems up to and including 33 kV with particular reference to 33 kV substation plant and protection. Transformer and switchgear manufacturers' experience would be an advantage. Corporate Membership of the Institution of Electrical Engineers or an equivalent technical qualification is desirable.

Applications to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY, from the Group Administrative Officer, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1. Closing date for receipt of completed applications is 18 Feb., 1961.

FOURTH ASSISTANT DISTRICT ENGINEER
BRISTOL

Salary according to Class K, Grade 12, Salary Scale 7, £965/£1,090 per annum, of the N.J.B. Agreement.

The duties of this post may involve work on operation, maintenance and construction, protection or planning within the Bristol District.

Previous experience of operation, maintenance and construction on underground and overhead systems up to and including 33 kV is desirable. It would be an advantage if candidates have worked in urban areas and carried out switching operations on city networks. The successful candidate may be required to undertake standby duty on a rota basis.

Possession of the Higher National Certificate in Electrical Engineering and the ability to drive a car will be an advantage.

Applications to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY, from the District Manager, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1. Closing date for receipt of completed applications is 18 Feb., 1961. (T 509)

CENTRAL ELECTRICITY GENERATING BOARD
South Eastern Division

LITTLEBROOK POWER STATION
Vacancy No. 33/61.

ASSISTANT ENGINEER (SHIFT OPERATION)

THE successful applicant will be responsible to the Assistant Shift Charge Engineers in the "A," "B" or "C" stations for shift work duties relating to boiler and turbine operation in the stations, with emphasis on efficient boiler house working.

H.N.C. electrical or mechanical, or equivalent qualification is preferred and some knowledge of control room work would be an advantage.

Salary within N.J.B. L.10, £1,240/£1,375 per annum, including London Allowance.

Applications giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Littlebrook Power Station, near Dartford, Kent, to arrive by 14 Feb.

W. H. DUNKLEY,
Divisional Controller.
(T 498)

CENTRAL ELECTRICITY GENERATING BOARD
London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule "A." Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (ELECTRICAL TEST)
FULHAM POWER STATION
Vacancy No. 61/63.

Sound technical training with knowledge of testing and routine maintenance of power station electrical equipment including generators, switchgear, transformers, motors and protective equipment. Salary: Class K, Grade 15, £815/£920 per annum.

Applications, quoting vacancy number may be made to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box No. 136, London W.1, to be received not later than 14 Feb., 1961. (T 478)

GOVERNMENT OF TRINIDAD
Ministry of Health, Water and Sanitation

ELECTRICAL ENGINEER

QUALIFICATIONS: Candidates must be Grad. I.E.E. with at least five years' post qualification experience in electrical installation and in particular heavy duty pumping equipment.

Duties: To organise and operate the Electrical Section for the maintenance and operation of all electrical installations and associated equipment in the Water Department and to advise on electrical matters.

Terms of Appointment: Contract/Gratuity terms for one tour of four years with salary in the scale of £1,000/£1,500. Free passages.

Write Director of Recruitment, Colonial Office, London S.W.1, giving full names, age, qualifications and experience, quoting BCD 117/38/052/D10. (T 458)

SOUTH WALES SWITCHGEAR LIMITED

Applications are invited for a Technical Sales Representative—switchgear training and qualifications to H.N.C. essential—must hold current driving licence. Successful applicant will be based at Wilmslow.

Apply stating age, qualifications, experience and salary required to: The Home Sales Manager, South Wales Switchgear Ltd., Rex Bldgs, Wilmslow, Cheshire, and mark the envelope "Confidential."

(T 516)

ELECTRICAL INSULATION ENGINEER

Applications are invited from qualified electrical engineers for a new position concerned with the design of High Voltage Bushings and the technical problems arising in their construction.

The post offers considerable scope and interest in this field and applicants must possess good relevant experience.

The Company is actively concerned with new developments in all aspects of electrical insulation and offers good career prospects and conditions of service.

Applications giving details of age, experience, qualification and current salary should be sent to:

Personnel Manager,
THE MICANITE & INSULATORS CO. LTD.,
Emoire Works, Blackhorse Lane,
Walthamstow, London, E.17.
(T 487)

AEI

Lamp and Lighting Co. Ltd.

DESIGN ENGINEER

The Lighting Equipment Engineering Department is expanding its activities and requires an additional Design Engineer to work on further development of the Company's range of lighting equipment.

Applicants should have a minimum qualification of H.N.C. in electrical or mechanical engineering. Two or more years on product design or development in this field of work is desirable.

Write in confidence for appointment, quoting brief details of career to date, to:

The Personnel Officer,
A.E.I. Lamp & Lighting Co. Ltd.,
Rotherwas Works,
Hereford.
(T 517)

BRITISH RAILWAYS

require

ELECTRICAL FITTERS

For maintenance of electrical equipment on the Distribution Section of the Eastern Region Electric Traction System in the London Area. Applicants must have served a recognised Apprenticeship. Experience with H.V. Switchgear and/or control system an advantage. Shift working is involved. Rate of pay is the equivalent of £11 13s 6d per standard week of 44 hours, plus appropriate shift allowance which averages 33s per week and enhanced pay for overtime and Sunday duty. Applicants will be required to undergo medical examination. Certain free and reduced rate rail travel facilities. Pension and Sick Pay Schemes. Prospects of promotion. Apply in writing giving details of age, experience, etc., to the Electric Traction Engineer (London Area) British Railways, Eastern Region, off Ley Street, Ilford, Essex. (T 481)

CITY OF LIVERPOOL EDUCATION COMMITTEE

City College of Technology
Byrom Street, Liverpool, 3.

Principal S. A. J. Parsons,
B.SC.(ECON.), M.I.MECH.E., M.I.PROD.E., M.B.I.M.

DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited from suitably qualified persons for the appointment of:

SENIOR LECTURER IN ELECTRICAL ENGINEERING (HEAVY CURRENT) (FULL-TIME)

Salary: £1,550 x £50—£1,750 per annum (1959 Burnham Technical Report). Increments within the scale may be added to the commencing salary for approved industrial or professional experience or research work of an equivalent standard.

Applicants should have experience on electrical machines and electricity supply. An honours degree in electrical engineering is essential; an appropriate professional qualification is desirable, together with teaching, industrial and/or research experience. The person appointed would be encouraged to undertake research and would be expected to organise post-graduate courses.

Application form (returnable by 17 Feb., 1961) and further particulars from H. S. Magnay, M.A., Director of Education, 14 Sir Thomas St, Liverpool 1.

THOMAS ALKER,
Town Clerk and Clerk to the Local Education Authority.

(J.6618)b. (T 465)

WEST SUFFOLK COUNTY COUNCIL

COUNTY ARCHITECT'S DEPARTMENT

APPLICATIONS are invited for the post of Electrical Engineer on APT. Grade IV (£1,140/£1,310); commencing salary in accordance with qualifications and experience.

Applicants should hold a university degree or equivalent diploma in electrical engineering or be Associate Members of the Institution of Electrical Engineers, with experience in the design and supervision of electrical lighting and power installations.

Housing accommodation may be made available.

Application forms obtainable from the County Architect, 13 Westgate St, Bury St. Edmunds, to be returned as soon as possible. (T 463)

TRANSFORMER TEST ENGINEER

to take charge of test department of small rapidly growing company making transformers up to 1,000 kVA. Good salary and excellent prospects for the right man. Some assistance with housing would be given if needed.

TRANSFORMERS & RECTIFIERS LTD.
Millmead, Guildford, Surrey
(T 421)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Lanarkshire Area

APPOINTMENT OF THIRD ASSISTANT ENGINEER (CONSTRUCTION)

APPLICATIONS are invited for the appointment of Third Assistant Engineer in the Area Construction Engineer's Department.

Candidates should have had a sound engineering training and preferably hold technical qualifications leading to Corporate Membership of the I.E.E. The successful applicant will require to assist the Construction Engineer in the preparation of switchgear and other schedules, checking switchgear and protection drawings and the supervision of the erection of 33 and 11 kV switchgear at site.

The salary and conditions of service will be in accordance with the National Joint Board Agreement. Present classification and grading being L.10 (Scale 10), present salary £1,190/£1,325. It is a condition of this appointment that the successful candidate will reside within a reasonable distance of the Lanarkshire Area Offices at Hamilton.

Application forms, which may be had from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

R. J. RENNIE,
Manager.

Montrose Cres,
Hamilton. (T 483)

DESIGNER-DRAUGHTSMAN

required, North West London area, knowledge in Electrical Wiring Accessories an advantage, good opportunity for right man. Apply stating age experience and references. Box No. 8165, Electrical Times.
(T 468)

CABLE EXPORTS SENIOR APPOINTMENT

Internationally known United Kingdom power cable manufacturer will shortly make a senior appointment to its Export Sales Department.

Candidates are required to have a successful sales record, not necessarily overseas, and to have reached a sound technical standard as regards electricity distribution and transmission.

Domicile London, but tours overseas will be made.

Replies must give full details and will be treated in the strictest confidence. Reply: Director (Export), Box No. 8167, Electrical Times.
(T 469)

BRITISH RAILWAYS

RAILWAY ELECTRIFIED LINES

OVERHEAD MAINTENANCE STAFF

Vacancies exist on the Eastern Region Electrified Lines in the London Area. Applicants selected will be engaged as Assistant Overhead Traction Linemen at a base rate of £9 18s per week. The average earnings for this grade amount to approximately £13 per week. Shift working is involved. Courses of instruction are given and good opportunities exist for promotion to higher grades. Certain free and reduced rate rail travel facilities. Pension and Sick Pay Schemes. Apply giving full particulars of age, experience, etc., to Electric Traction Engineer (London Area), British Railways, Eastern Region, Off Ley St, Ilford, Essex.

(T 518)

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

OPERATIONAL STAFF

The engineering organisation of the Rutherford High Energy Laboratory is being expanded and technical staff are required to work in a group concerned with the operation of a large Proton Synchrotron which will be used in the Laboratory's research programme.

Applicants with a sound basic engineering training and possessing good experience in the control of large power plant are required to undertake the control room duties of a 120 MVA power plant comprising a large motor alternator set feeding transformers and an associated convertor installation.

Possession of an appropriate National Certificate in Electrical Engineering together with a general knowledge of convertor or rectifier installations, control and protection systems and industrial electronics would be an advantage. Several posts are available, the salary being in the range of £1,015 to £1,410 according to age and experience.

The Rutherford High Energy Laboratory is a centre for research into fundamental nuclear science and is being constructed adjacent to the Atomic Energy Establishment at Harwell.

If you are interested in joining this new organisation then please send a **postcard** for further details to the Recruitment Officer.

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE
Harwell, Berkshire.
quoting Reference No. VN28/49 (T 474)

PORT OF MANCHESTER
ELECTRICAL ASSISTANT

The Manchester Ship Canal Company have a vacancy for an Electrical Assistant in the Mechanical Engineer's Department.

Applications for the position are invited from candidates, who should be not more than 40 years of age, with either a university degree or corporate membership of the Institution of Electrical Engineers and with experience in the design, layout and maintenance of electrical equipment appertaining to dock and railway undertakings. The successful candidate will be required to pass a medical examination and to become a member of the Company's contributory superannuation scheme.

Applications, containing full particulars of age, education, qualifications, experience and salary envisaged, should be addressed to the Mechanical Engineer, Manchester Ship Canal Co., Ship Canal Hse, King St, Manchester 2.

Envelopes should be marked "E.A. PERSONAL."

(T 484)

LIGHTING SALES ENGINEER

Applications are invited by large Lighting Fitting Manufacturers for an experienced Lighting Sales Engineer for Scotland.

An excellent salary is offered to applicant who has the required sales ability and engineering background. Car and expenses provided, also opportunity to join superannuation scheme.

Write in strict confidence, giving full details of age, sales experience, education and training, etc., to Box No. 8169, Electrical Times.

(T 470)

AEI

Associated Electrical Industries Limited

INSULATION DEVELOPMENT

GRADUATE ELECTRICAL ENGINEER required for interesting work on the development of insulation systems for rotating machines. The work involves the evaluation of insulation materials and systems using model systems such as motorettes, and there is scope for initiative in developing new testing techniques. Some previous experience in this field would obviously be an advantage but it is not essential; enthusiasm would be equally acceptable.

Please write for application form quoting reference G.18 to:

Personnel Manager,
Associated Electrical Industries (Manchester) Ltd.,
Trafford Park,
Manchester 17

(T 431)

SENIOR
ESTIMATING ENGINEER

required for London Office of National Contractor, capable of preparing tenders and designing all types of commercial and industrial installations. Bonus scheme in operation in addition to salary. Apply in writing giving full details of qualifications, age, experience, etc., or telephone for an appointment. Duncan Watson (Electrical Engineers) Ltd., 60 Worship St, E.C.2. Telephone No.: BIS. 4752.

(T 480)

GPO

A FIRST-CLASS JOB
IN THE G.P.O.

Men between the ages of 20—35 are required to work in Central London on installing and maintaining telephone apparatus and transmission equipment. Older men, up to the age of 45, will be accepted if they have the experience which is particularly suitable.

Commencing pay is £9 16s per week rising to £12 2s.

Men who show ability to progress will be given every opportunity to qualify for Technical Officer posts on which the salary is £600 a year rising to £850. Further promotion is available.

Apply in writing stating age and experience to:

Chief Regional Engineer
(Ref. S/D2A(X2)),
London Telecommunications Region,
Waterloo Bridge House,
Waterloo Road,
London, S.E.1. (T 14)

AEI

Associated Electrical Industries Limited

HIGH VOLTAGE DIELECTRIC PHENOMENA

Engineers with leanings towards physics or Physicists with engineering bent required to contribute to the knowledge of mechanisms of failure of insulation in service by developing new techniques of measurement of dielectric properties.

This is a relatively unexplored field in which enthusiasm for research work is more important than previous experience.

Please write quoting reference E.18 to:

Personnel Manager,
Associated Electrical Industries (Manchester) Ltd.,
Trafford Park,
Manchester 17

(T 432)

REQUIRED BY CONSULTING ENGINEERS

JUNIOR CONTRACT ENGINEERS

to assist in the handling and administration of contracts for electrical equipment, principally associated with transmission and distribution.

Minimum qualifications: recognised apprenticeship, H.N.C. and two years' experience similar work.

Salary in accordance with qualification and experience.

Pension and Bonus Scheme.

Five-day week.

Apply in writing stating age and experience, not later than 14 Feb., 1961, to Preece, Cardew and Rider, 8, 10 and 12 Queen Anne's Gate, Westminster, London S.W.1.

(T 476)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern Division

APPLICATIONS are invited for the following appointments at West Thurrock Generating Station (Essex):

MAINTENANCE ENGINEER (ELECTRICAL)
(S.V. No. 1432)
MAINTENANCE ENGINEER (MECHANICAL)
(S.V. No. 1433)

Salaries: N.J.B., Class M, Grade 6, Scale 15, £1,650/£1,830, plus London Weighting.

Applicants should have had wide practical experience in electrical or mechanical maintenance at modern generating stations and should preferably be Corporate Members of the Institution of Electrical or Mechanical Engineers.

Experience in the field of labour relations and modern management techniques would be an advantage.

Applications, quoting the appropriate Reference S.V. No., stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, by 11 Feb., 1961. (T 472)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area

SENIOR SERVICE CENTRE ASSISTANT
HILLSBOROUGH SERVICE CENTRE

APPLICANTS must have had previous experience in Service Centre work including the sale of electrical appliances, hire purchase agreements, handling of inquiries, taking accounts, and must be capable of advising consumers on any matter relating to the use of electricity in their homes. A knowledge of display work would be an advantage. The successful candidate will be in charge of the Service Centre and responsible for the control of the staff.

Salary: N.J.C. Grade 2, £700 x £25—£775 per annum.

Applications, giving full details of age, qualifications and experience should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield 1, not later than 17 Feb., 1961. (T 507)

CENTRAL ELECTRICITY GENERATING BOARD
Southern Division

ASSISTANT SHIFT CHARGE ENGINEER
PORTSMOUTH GENERATING STATION
SEC/3.129.

APPLICANTS should have had previous experience in a modern generating station, and manufacturing works experience will be an advantage. Preference will be given to those who either possess qualifications and experience leading to corporate membership of a recognised professional institution, or who are studying for the examinations of such an institution. The successful candidate may be required to undertake duties in either the boiler house or turbine room.

Salary: N.J.B. Scale 8, Grade H.9, £1,040/£1,165.

Special application forms, obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 13 Feb., 1961. (T 494)

CENTRAL ELECTRICITY GENERATING BOARD
South Western Division

Vacancy No. ET/AV/15/61
THIRD ASSISTANT ENGINEERS (CONTROL)

REQUIRED in the System Operation Department, near Bristol.

Superannuation Scheme. Salary: N.J.B. Class BX, Grade 8, Scale 11, £1,105/£1,410 per annum, plus 10% shift allowance.

Applicants should have had a good general and technical education and preferably have attained at least H.N.C. standard. Experience in a steam power station will be an advantage.

Duties will cover switching, load despatching and general operation work in the Bristol Grid Area Control Room.

Applications on Form AE6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 14 Feb., 1961. (T 505)

UNIVERSITY OF CANTERBURY
CHRISTCHURCH, NEW ZEALAND

LECTURER IN ELECTRICAL ENGINEERING

APPLICATIONS are invited for the above-named position. Applicants should hold a university degree in electrical engineering and have subsequent experience in research, in teaching or in industry. A knowledge of the fundamentals of nuclear engineering is also essential. Duties will include lecture, tutorial and laboratory work in an electrical engineering department which embraces both the power and electronic sides of the subject. The successful candidate will also be required to assist in the introduction of short lecture courses on nuclear engineering and contribute to the installation and operation of a compact but well equipped nuclear engineering laboratory with a sub-critical reactor as its central feature. Adequate facilities and time for research will be provided.

The salary scale is £1,250/£1,700 per annum.

Further particulars and information as to the method of application should be obtained from the Secretary, Association of Universities of the British Commonwealth, 36 Gordon Sq, London W.C.1.

Applications close on 28 Feb., 1961. (T 462)

AIR MINISTRY
Works Designs Branch

REQUIRES in London and Provinces
ENGINEERING DESIGNER
DRAUGHTSMEN

experienced in preparation of schemes for illumination and electrical equipment of buildings or schemes for H.V. and M.V. electrical distribution. Candidates should have served recognised apprenticeship or had equiv. training and also have had practical exp. O.N.C. an advantage. Financial assistance and time off for recognised courses of study. Promotion and pension prospects. Five-day week with 18 days' paid leave per year initially. Overseas tours for which special allowances granted.

Salary: in London ranges from £805 (age 25) to £980 p.a., somewhat lower in Provinces. Commencing salary dependent on age, quals. and exp. Applicants, who must be natural born British subjects, should write quoting O/N King's Cross 4354 to Air Ministry, W.G.d, Theobalds Rd, London W.C.1, or to any Employment Exchange, giving age, details of training, quals., full particulars of former posts held and copies of any testimonials. Candidates selected will normally be interviewed in London and certain expenses reimbursed. (T 82)

THE NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER
SUB-AREA ENGINEERING DEPARTMENT
PRESTON

APPLICANTS must have had sound training in the testing and maintenance of protective gear.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £965/£1,090 p.a. Grade L.13. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lune St, Preston, and returned to him by 13 Feb., 1961.

ASSISTANT (WAYLEAVES)
SUB-AREA SECRETARIAL DEPARTMENT
KENDAL

Applicants should be experienced in the negotiation of wayleaves, the keeping of registers, the settlement of claims for damages arising out of the construction of supply lines and the selection of and preliminary negotiations for substation sites.

Salary Scale: £700 x £25—£775 p.a. Grade 2. N.J.C. Conditions.

Applications on forms to be obtained from the Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, and returned to him by 13 Feb., 1961. (T 460)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern Division

APPLICATIONS are invited for the following appointments at West Thurrock Generating Station (Essex):

SHIFT CHARGE ENGINEERS
(S.V. No. 1434)

Salary: N.J.B., Class M, Grade 6, Scale 15, £1,650/£1,830, plus London Weighting, plus 10% shift allowance.

Applicants should have had wide operating experience in modern generating stations and should preferably be Corporate Members of one or more of the recognised engineering institutions.

Experience in the field of labour relations and modern management techniques would be an advantage.

Applications, quoting Reference S.V. No. 1434, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, by 11 Feb., 1961. (T 473)

A GENUINE opportunity for man of integrity and good business acumen. View Directorship with well-established North West Electrical Wholesalers.—Box C53, Lee and Nightingale, Liverpool 2. (T 482)

CONSULTING Engineers have vacancy for a qualified ASSISTANT ELECTRICAL ENGINEER for work of varied and interesting nature. Please send full details to: Messrs. Mackness and Shipley, Parliament Mansions, Abbey Orchard St, London S.W.1, quoting ref. P.1210, and marking envelope "Confidential." (T 490)

CABLE CONTRACTS ENGINEERS required with experience installations to at least 33 kV. Must be prepared travel anywhere in U.K. Apply, giving details of work carried out, to Contracts Manager, Enfield-Standard Power Cables Ltd., Stockingswater La, Brimsdown, Middx. Tel. No.: Howard 2711. (T 464)

CABLING JOINTER wanted, capable of jointing up to and including 11 kV and also, if necessary, to work on live cables. Must be willing to travel anywhere in the Midlands, Lincolnshire and Lancashire areas. Must be able to drive. Good rates of pay and working conditions.—Box No. 8155, Electrical Times. (T 412)

ELECTRIC CONTROL GEAR ENGINEER/DRAUGHTSMAN, experienced in Circuitry for Heating, Ventilating and Oil Burner Controls required by Consulting Engineers. Candidates should have at least a Higher National Certificate or Grad.I.E.E. Apply stating qualifications and experience to Kennedy and Donkin, 12 Caxton St, S.W.1. Ref.: FBT/WBH. (T 297)

ELECTRICAL SUPERVISOR for large Building Firm. Must have first-class contracting experience, able to control labour and set out work. Good prospects. State experience and salary required. Write Box E.T. 168, c/o Hanway Hse, Clark's Pl, E.C.2. (T 459)

ELECTRICIANS required for mobile staff for installation work. Based on London. Generous terms, all board and lodging while out of London and travelling expenses found.—Write Box No. 8163, Electrical Times. (T 467)

ELECTRICAL ENGINEERING ASSISTANT required with experience in preparing specifications for new electrical installations in buildings. Up to £950. Pensionable. Prospect of advancement. Up to £1,250 for those obtaining H.N.C. (Elec.). Form from Chief Engineer (GS/T/253/2), L.C.C., County Hall, S.E.1. (T 515)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

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copper bars & rods

HOT WORKING COPPER

The first stage in the manufacture of a wrought copper product consists of hot working a casting.

The wire bars used for hot rolling are of various selected qualities and are channelled carefully into the appropriate finished form.

We have been hot rolling copper for many years and have three separate mills for the process.

FREDERICK SMITH & COMPANY ANACONDA WORKS · SALFORD 3 · LANCS

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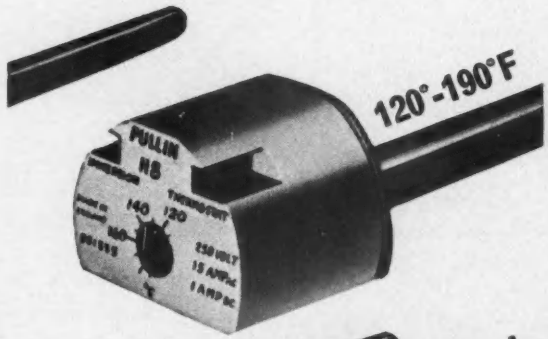

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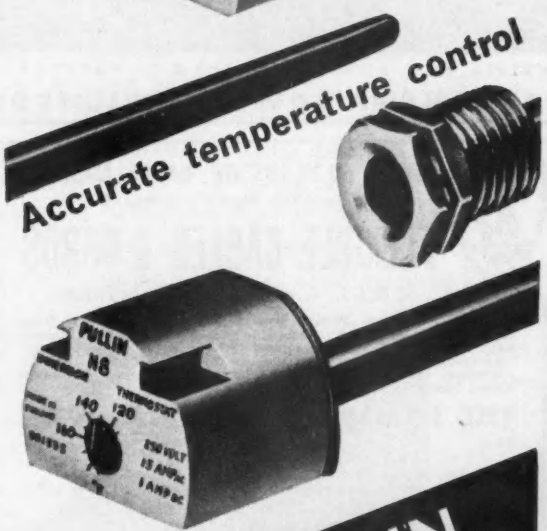

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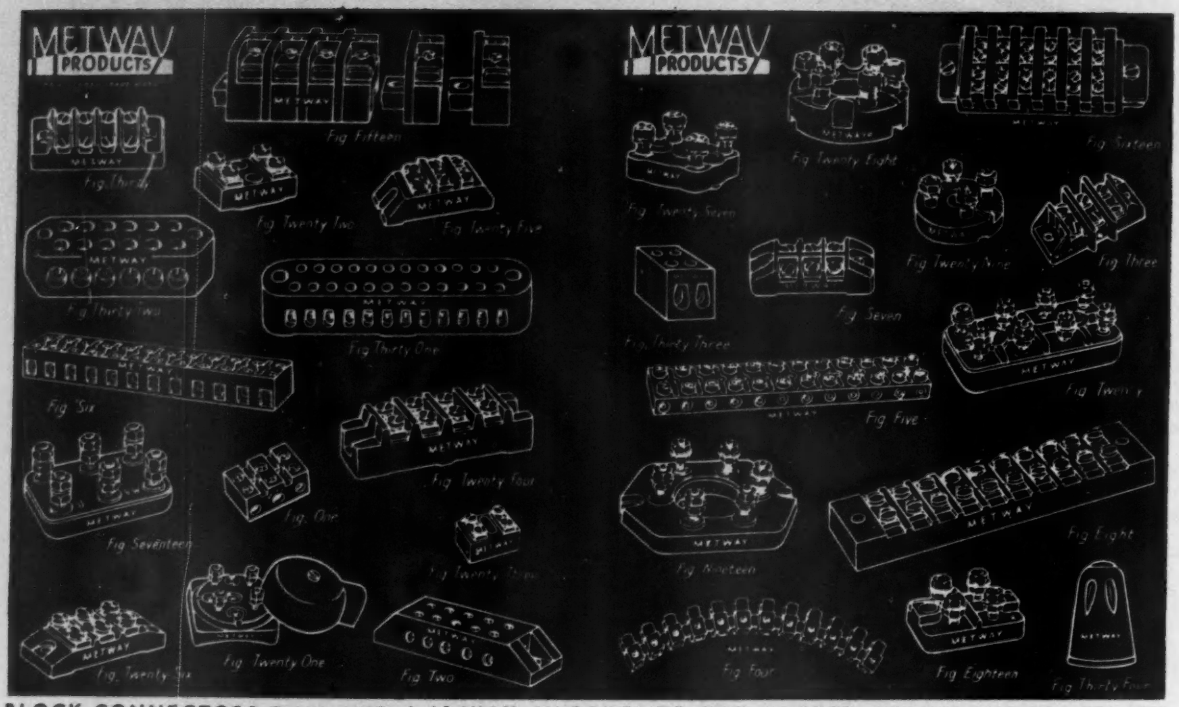

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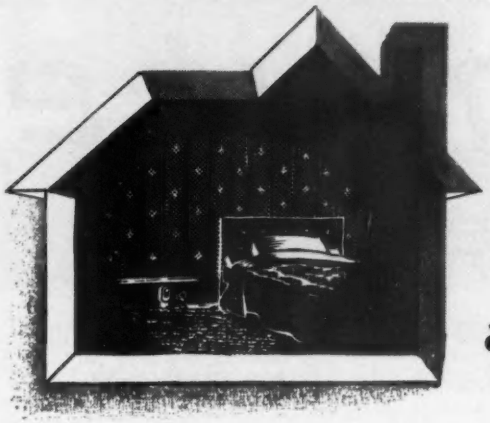

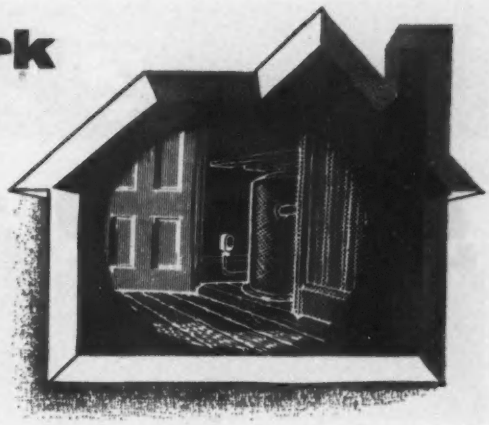

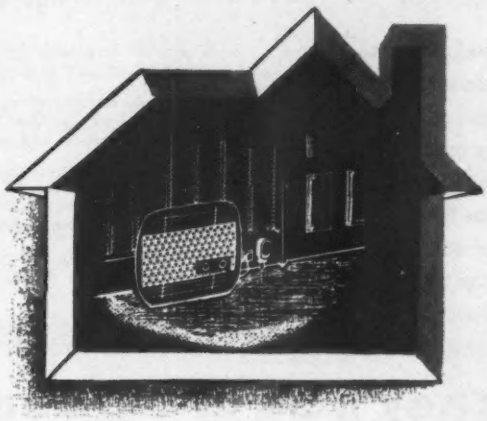

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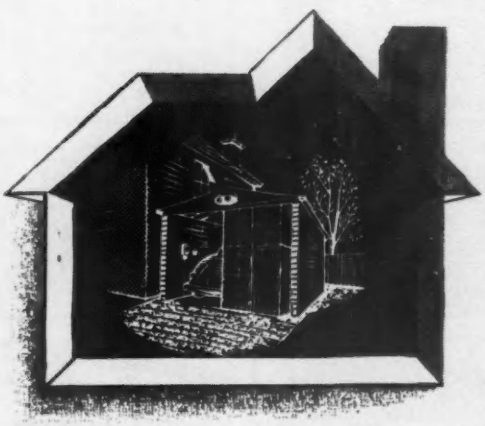

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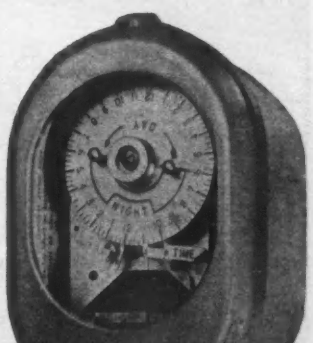

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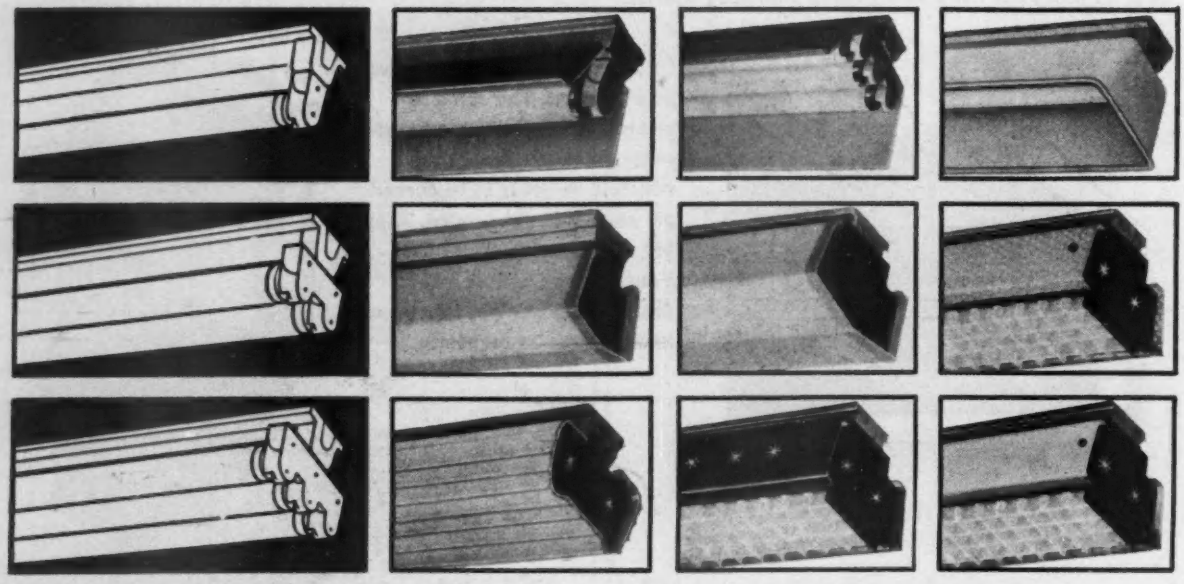

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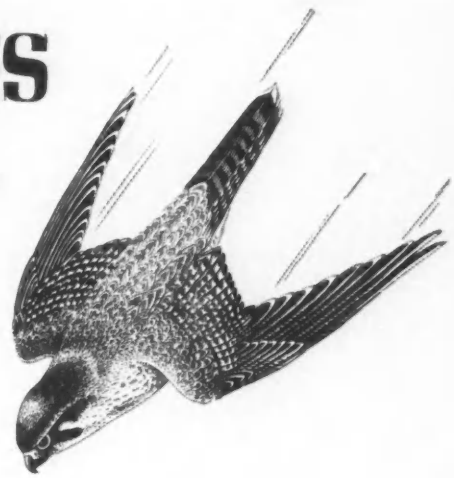

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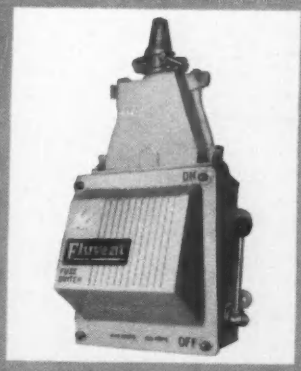

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